THE BRITISH JOURNAL

OF

OPHTHALMOLOGY

NOVEMBER, 1932

COMMUNICATIONS

ANTERIOR DIALYSIS OF THE RETINA: DISINSERTION OR AVULSION AT THE ORA SERRATA

BY

J. RINGLAND ANDERSON

MELBOURNE

PART I

"Abreissung der Ora serrata," "désinsertion," "rétino-dialyse."

As the condition about to be described is comparable with iridodialysis, "anterior retinal dialysis" appears to be a suitable title. In each form of dialysis a delicate tissue yields at its weakest point, close to its periphery. The application of the term "posterior dialysis of the retina" to the rare form of separation at the optic disc is a further reason for preferring this term to "disinsertion." Though in practice it may be useful to consider that the retina is inserted at the ora serrata it appears unwise to separate it artificially in this way from the more anterior part of the inner wall of the optic cup. It is unnecessary to introduce a new term into ophthalmology. Probably the separation is not at the ora serrata but immediately behind it. Scheffels appears to use "dialysis" and "detachment at the ora" synonymously.

Gonin found an anterior dialysis in 10 per cent. of his series of 300 retinal detachments and Arruga (1932) in 10 per cent. of 216. Leber in 1908 stated that anterior avulsion of the retina in detachment was frequently seen with the ophthalmoscope.

This paper is a study of examples of anterior dialysis of the retina, more particularly of those the origin of which is as yet unexplained. The application to the latter of the inaccurate title "spontaneous" is due to our ignorance of the productive mechanism. Such a dialysis must be due either to some developmental defect, some trauma, or some process more or less akin, to those which are recognized causes of secondary dialysis. It is wise to study the mechanism of the latter for probably this will throw some light on the search for the less obvious causes of unexplained dialysis.

Let us consider the influences that aid the separation of the retina at the ora serrata under three headings:

I. Structural characteristics.
II. Pathology of the zone.
III. Effects of Trauma.

Characteristics of Incidence

It is necessary to consider several features of anterior retinal dialysis which are almost constant and more or less characteristic of the disorder. They are the preponderance of

(1) the inferior temporal site
(2) the male sex
(3) non-myopic refraction
(4) a low age of onset.

The inferior temporal quadrant is certainly predisposed to dialysis. The following statistics are based on the study of eight patients of my own and fifteen recorded in the literature. Among these the inferior half of the globe was affected in 96·5 per cent. The only dialysis affecting the upper half occurred after cautery puncture in a highly myopic girl, aged 12 years. Of these cases the inferior temporal quadrant was affected in 17, that is in 74 per cent., the superior temporal in one and the inferior nasal quadrant in three. Once the temporal half and twice the lower half of the globe was affected. So 95 per cent. were situated in the inferior half of the globe, and 85 per cent. were in the temporal half. Löhlein (1930) refers to a young female patient, who was emmetropic, and had a large peripheral rent in the inferior nasal quadrant of each eye. Shapland (1931) found 73 per cent. of dialyses in the lower half and 54 per cent. in the inferior temporal quadrant. This is in striking contrast to the presence of 53 per cent. of round holes in the superior temporal zone and 73 per cent. of arrow-head tears in the upper half of the globe.

If one combines the two series there are 64 separate dialyses.

59 per cent. were found in the inferior temporal quadrant.
10 per cent. were found in the superior temporal quadrant.
11 per cent. were found at the inferior pole. (6 o'clock.)
6 per cent. were found at the temporal pole. (Right eye 9 o'clock. Left eye 3 o'clock.)
10 per cent. were found in the inferior nasal quadrant.
3 per cent. were found in the superior nasal quadrant.
1 per cent. were found at the nasal pole. (Right eye 3 o'clock. Left eye 9 o'clock.)
84 per cent. were in the temporal half of the globe.
86 per cent. were in the inferior half of the globe.
14 per cent were in the superior half of the globe.
16 per cent. were in the nasal half of the globe.

Only one of Gonin's series (1930*a*) of 25 dialyses was not below the horizontal meridian and it was just above the temporal limit of this meridian. He had seen a dialysis of the superior retina only as a result of injury.

In attempting to explain this, it is well to consider first why the neighbourhood of the ora serrata itself is apt to be a line of lowered resistance. It is a zone predisposed to cystoid degeneration, an agent capable of causing rents, and one that develops most markedly and probably earliest in the temporal half. We know

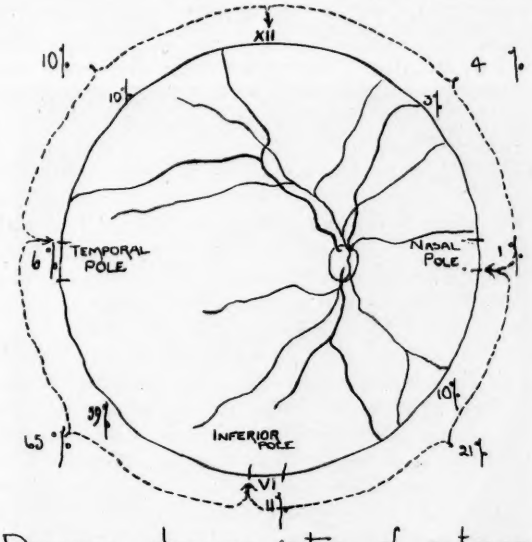


Diagram showing sites of anterior retinal dialyses.

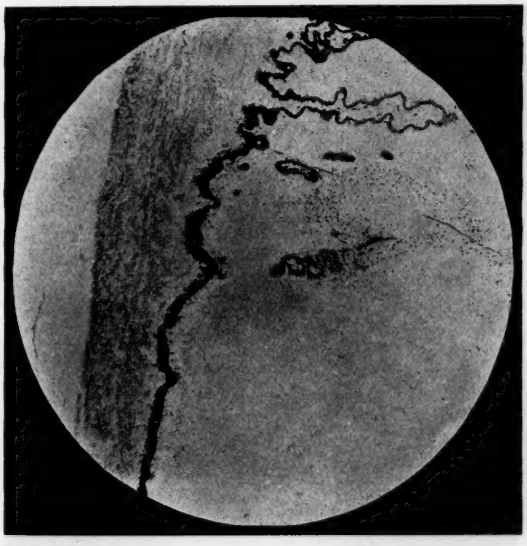
also that not only is the anterior portion of the retina and particularly the temporal area most exposed to direct trauma, but that this area shares with the macular zone the bulk of the damage resulting from indirect trauma. We must remember too the possibility of repeated small contusions on this exposed area producing sufficient damage to start the mechanism that tears the retina at its margin. If this is so any structural defect will greatly increase the risk. Let us therefore consider briefly the structural characteristics of this zone. A fuller description is given in Chapter II. Detachment of the Retina.

The anterior margin of the retina—the ora serrata—derives its name from the more or less dentate appearance of its surface. Just short of its margin the retina, apart from the foveola, is thinnest (0·14 mm. compared with the retina above and below disc, 0·4 mm.) Though the retina at the equator appears to be slightly thinner than at the ora, yet the latter contains less actual tissue. This is the area most affected by cystoid degeneration and its development beyond physiological limits. The periphery of the retina is therefore, apart from the macula, its most delicate part. It also contains least supporting tissue such as nerve fibres and vessels. The fact that retinal vessels may run intact across tears is sufficient proof of the resistance they offer to the formation of a tear. Recent literature abounds with illustrations of such a state, *e.g.* see Arruga, Vogt, and Gonin. The peripheral limit of retinal vessels is 1 mm. behind the ora. The nerve fibre layer is thickest (20 to 30 μ) on the upper nasal and lower margins of the optic disc. The nerve fibre and the ganglion cell layers cease 0·5 to 1·0 mm. from the ora. The outermost periphery of the retina contains scattered neuroglia cells in place of ganglion cells and basal cones of Müller's fibres in place of nerve fibres. The membrana limitans interna retinae, like its ciliary counterpart, tends to disappear towards the margin of the retina. The periphery of the retina is also an area of transition and of growth. It is supplied by the end branches of a vascular system.

Along the line of the ora serrata three tissues are attached. (*a*) The vitreous base is firmly attached at the ora serrata and to a narrow area in front of it. The epithelial cells of the ciliary zone send out prolongations which are continuous with the vitreous fibrillae. This attachment defies the process of separation that causes detachment of the vitreous from the internal limiting membrane. When the vitreous shrinks under the influence of hardening fluids and in morbid conditions, it remains adherent here. When severe trauma tears the vitreous away the ciliary epithelium goes with it and the end of the retina loses its attachment. The anterior and posterior limiting layers of the vitreous are attached in front and behind the vitreous base respectively, and the line of conden-

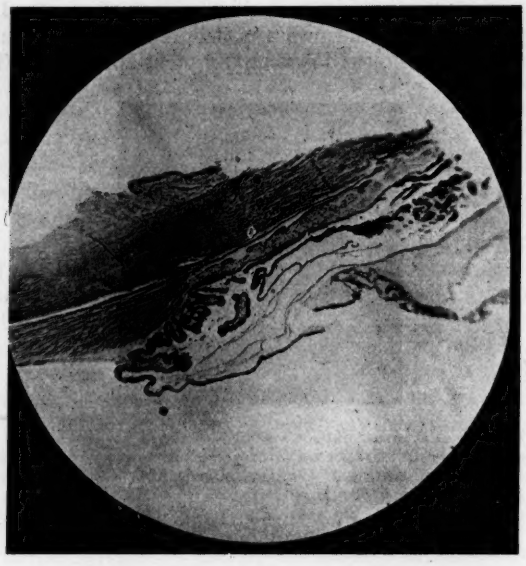
sation which appears between the secondary and tertiary vitreous remains adherent at the ora serrata throughout life. The attachments of the zonule itself to the ciliary epithelium extend as far posteriorly as the ora serrata. (*b*) The retina beyond the ora serrata is reduced to a layer one cell thick, which, instead of being insecurely attached, as the retina is, to the retinal pigment epithelium, is firmly attached to the ciliary pigment epithelium. Therefore

Dissection of anterior half of eyeball. A pin is passed through the vitreous base and drawn away to show traction on the adjacent retina and even tearing of the pars ciliaris as a result of its firm attachment there. The margin of the retina is seen midway between the pin and the pigment. A pin inserted through the posterior vitreous did not hold and produced no traction on the retina.



Microphotograph of oblique transverse section of human eyeball, showing fibres of suspensory ligament leaving the pars ciliaris retinae.

the separation of the two retinal layers in retinal detachment tends to end at the ora serrata. (*c*) As the pigmented epithelium of the ciliary body is attached to the choroid the periphery of the retina



Microphotographs of dissected human eyeball showing the periphery of the retina. The firmly adherent vitreous has been detached and drawn to the right where it is seen lying behind the iris. The pars ciliaris retinae and its pigment has torn away cleanly from the ciliary body.

The second photograph shows the vitreous adherent to the periphery of the retina which shows cystoid degeneration.

The third view shows the manner in which the pigmented epithelium of the ciliary region strips off from the underlying tissues.

may be involved in the action of the outermost part of the ciliary muscle—the tensor of the choroid. Through the firm attachment of the vitreous base to the epithelium of the pars plana and of the latter to the pigmented epithelium of the ciliary body, each tissue finds anchorage to the choroid. To this triple line of union the otherwise loosely adherent inner retinal layer is attached.

It must always be remembered that not only have the protein basis of the vitreous, Müller's fibres and the membrana limitans interna a common origin, but that in life they appear to be connected. This union may be greatly increased by the formation of adhesions, which appear to form so readily. Tissues with a common origin often share the morbid changes of injury and disease. Can an unduly strong attachment of the base of the vitreous play any part in producing anterior dialysis? Fuchs (1920) considered that in his case the anterior boundary membrane of the vitreous predisposed to dialysis. Gonin at the French

Ophthalmological Society's Congress in 1930, said that retinal "désinsertions" were due to a wide adhesion of the vitreous body to the retina. Once the pars ciliaris retinae and the ora serrata itself are torn from the retina by its adherent base, the retina itself lies loosely on the pigment epithelium until fluid collects beneath it, or fluid vitreous passes through the tear and causes its detachment.

Why do the vast majority of anterior dialyses occur in the temporal half of the globe? This portion of the retinal periphery is the earliest to be affected by cystoid degeneration; it is the most exposed to trauma, and it shows certain structural characteristics. The periphery of the retina is thinnest on the temporal side.

The teeth of the ora serrata are most plain where the ciliary body is shortest, that is on the nasal side. The ciliary body is narrowest in the superior nasal quadrant (4·6 to 5·2 mm.). "On the temporal side they often fail completely, and the border is then only finely and irregularly wavy or angular. The teeth correspond in position to the intervals between the ciliary processes and all the irregularities of the development in the corona ciliaris are reflected in the ora serrata." Salzmann (1912*a*). Even in the adult, toothed processes may extend here and there to the ciliary processes, particularly in hypermetropic and malformed eyes. Mann (1928*a*). The teeth are least marked where the ciliary body is broadest. Salzmann and others consider that in hypermetropia the ciliary muscle is narrower than in emmetropia and that it is widest in myopia. The temporal part of the ciliary muscle resembles the myopic type.

During the fourth month of intra-uterine life the junction between the retina and the ciliary epithelium is just behind the ciliary processes. (Schultze.) This junction constantly moves backwards. More strictly, according to Salzmann (1912*b*), the change is due to the mesodermal walls of the eye growing further forwards over the border of the retina. According to this view, the more the mesoderm grows forwards the greater is the tendency for the teeth to disappear, and so as one would expect, the smallest teeth are found on the temporal side. At birth the orbiculus ciliaris is therefore very short. (1·4 mm. whilst in adults it is 3 to 4 mm.) The ora serrata is 1 mm. further from the limbus on the temporal side of the globe than on the nasal side. This asymmetry is more marked in many of the lower mammals. (Duke-Elder.) About the time of birth the border of the retina tends to become thrown into an artificial fold, which projects into the vitreous and slightly forwards. This, the fold of Lange, still tends to form at the age of 2 years. By the seventh year adult conditions are present on the nasal side. At this age in the child, and nasally in the adult, there is a marked projection of retina over ciliary epithelium.

One is justified in concluding that the wider ciliary body and the absence of teeth in the inferior temporal region of the ciliary body prove it to be more developed than the nasal side. This is the very quadrant in which anterior dialyses are most apt to occur. Cystoid degeneration is more marked also in the temporal half of the globe.

According to Donders the most peripheral portion of the retina is blind. As the nasal field is only 60° wide, it appears that, at least, on the temporal side of the retina, a zone 4 mm. broad is devoid of visual function. Salzmann considers that the histology of the retina does not justify this conclusion. It is strange that this zone is the site in which spontaneous dialyses are most commonly found. This absence of function may explain the little interference with vision in an early dialysis, and also the interval between injury and recognition of visual loss.

Anterior dialysis is most common below the horizontal meridian. Is this fact associated with the phylogenetic youth of the lower in comparison with the senility of the upper retinal area? Ida Mann (1928*b*) has shown that the lower area may be considered as "fluid", and the upper as "stable" in phylogeny. Throughout the vertebrate order the lower area appears earlier and develops further the higher the animal is in the scale. "It appears to be added to the upper area by growth of areas bounding the foetal fissure." Adaptive modifications are most apt to occur in fluid regions. The ontogeny, too, of the various orders shows that this area is younger and more plastic than the upper. In the 5 mm. human embryo the lower area is just recognisable, while the upper is quite advanced. It is not till the 17 mm. stage that nerve fibres are present below and more plastic than the upper. In the 5 mm. human embryo the phylogenetic youth accounts for structural variations in the lower area in different orders, so ontogenetic youth may account for the frequency of congenital defects, and possibly of defects with a relatively early onset, such as anterior dialyses. The majority of retinal holes that are degenerative in origin appear in the older retinal area and almost all dialyses appear in the "fluid" area.

The Male Sex

Amongst 17 patients with anterior retinal dialyses, 15 were male. One of the affected females was a high myope who developed a dialysis after operation—not a spontaneous dialysis. Including this patient 88 per cent. were male whilst in earlier series of all forms of detachment the average percentage of males was over 60 per cent., and this percentage was not affected in Sattler's series in which non-traumatic cases were excluded.

Does the pursuit of sports such as football, boxing, and high diving mean extra trauma in the male sex? The inferior temporal quadrant is certainly the most exposed to injury. In only

one of my eight patients, did injury play any direct and definite rôle. Of the two patients reported by Juler one had done a considerable amount of boxing but none for four years, and the other who had bilateral dialyses, had received two separate blows on the head. Thirty patients in Shapland's series of 134 patients with retinal detachment gave a history of recent local or general trauma. Of these 14 had a dialysis, 5 one or more round holes, 5 horse-shoe shaped holes and 5 irregular rents and 1 a radial slit. Each of the 5 patients who presented an irregular rent gave a history of recent local injury. So 100 per cent. of those with an irregular rent were probably influenced by local trauma, 38 per cent. of those with dialysis, 22 per cent. of those with horse-shoe shaped holes, 20 per cent. of those with a radial slit and only 16·6 per cent. of those with round holes. Of 11 other patients with dialysis only 3 gave a history of recent trauma, so the percentage is probably about 35.

A patient reported by Ballantyne (1931) is of great interest. A man, aged 24 years, noticed that his vision was defective a month after he had received a blow on the left eye when boxing. The upper part of the fundus was of a uniform orange colour and showed no sign of retinal vessels. A small area towards the lower periphery was normal and showed one or two vessels. The large intermediate zone contained a prominent, slightly billowy, veil of tissue, which ended near the lower periphery in a grey, curled and somewhat ragged edge. This tissue was the retina which was torn from the pars ciliaris from 8 o'clock to 2 o'clock. It had fallen down and presented its posterior surface to the observer. No retinal vessels were visible in it but a shadowy suggestion of a vessel near its upper limit and one or two small twigs on the lower curled edge were found. The tissue moved slightly with vertical ocular movements. The patient had central fixation and a field, to a 5/330 white spot, which embraced the fixation point. In the subsequent discussion Juler stated that he had recently seen a boy, with a temporal dialysis, in whose eye the posterior retinal surface was presented. Goulden also had seen a similar case. It is probable that a small dialysis may appear after an injury and may heal spontaneously. Haemorrhage in the periphery of the vitreous may obscure it from view.

Has the preponderance of males amongst patients with this disorder and amongst those with spontaneous retinal haemorrhage of adolescence any connection? Since Eales fully described the latter condition in 1880 and 1882, most bodily disorders have been mentioned as causes and an unending list of therapeutic measures has arisen. Gonin considers that one exciting cause of retinal dialysis is an effusion of blood—a spontaneous haemorrhage of adolescence which he considers is related to tuberculous changes in the retinal veins. There is considerable evidence to show that

the majority of these haemorrhages arise between the equator and the ora serrata. Velhagen (1932) and others hold the view that tuberculosis is not only the most common cause of juvenile vitreous haemorrhages but also of retinal detachments in young emmetropes. It is likely that this explanation does not apply to all countries for the incidence of ocular tuberculosis appears to be very variable.

Non-Myopic Refraction

The majority, that is, over 60 per cent. of patients with detachments are myopic and if anterior dialysis is excluded the percentage is higher. Of 16 patients with dialysis 13 were non-myopic, 2 were slightly and 1 was highly myopic. In the last case the dialysis was not spontaneous and it followed operation. In a small series of 19 patients with detachment excluding dialysis, only one was not myopic and the average degree of myopia was −11·3 D. The average error amongst eight patients with dialysis was +1·3 D. Shapland found 27 of his patients with dialysis to be emmetropic, 1 to be aphakic, 6 to be low myopes, and 3 to be high myopes. In the combined series of dialysis 77 per cent. occurred in non-myopes, 15·4 per cent. in low myopes, and 7·7 per cent. in high myopes.

Low Age of Onset

In Shapland's series of 100 cases of detachment that were operated on, the average age of onset was 41 years 6 months. This is much lower than the average age in most series, which is just over 60 years. Amongst sixteen patients with dialysis the average age was 27 years. Two were 15 and one was 16 years of age, and the oldest was a sailor of 54 years. All the others were under 40 years.

There appears to be a tendency for detachments of relatively early life to occur in the lower half of the retina, and for those of later life to occur above. In an analysis of 49 patients who were considered by their surgeons to be suitable for operation, 30 showed the initial hole in the upper half of the globe, and 19 in the lower half. The average age of the former group was 47 years and of the latter 28 years. Gonin's series of 25 cases of retinal dialysis can be summarised as follows:

Age	Per cent.	Number	Emmetropia	Aphakia	Mild Myopia	Marked Myopia
Under 25 years -	44	11	7	2	2	—
Between 25 and 35	28	7	6	—	1	—
Between 35 and 45	12	3	1	—	1	1
Between 45 and 55	16	4	2	1	—	1
Total - - -	—	25	16	3	4	2
Percentage - -	—	—	64	12	16	8

Pathology of the Vitreous

The attachment of the posterior limiting membrane of the vitreous to the retina is wide and, according to some observers, extends to the equator. Samuels (1930). It is conceivable that traction, by means of the large radiating lamellae of the vitreous, could produce a dialysis. Once the limiting membrane is detached cellular membranes form on its external surface and they can pull on the retina.

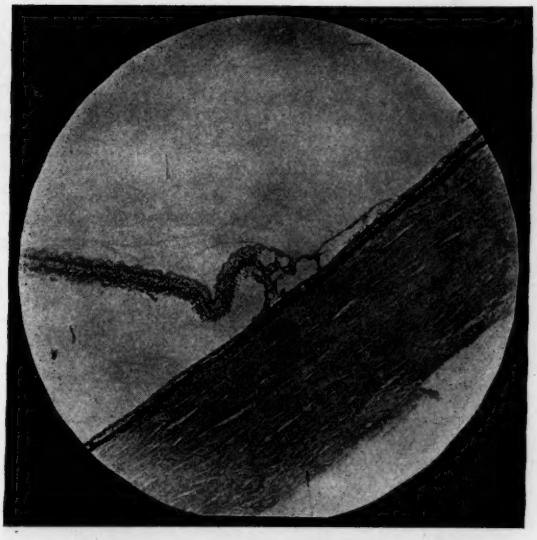
As the vitreous base is so firmly attached in the neighbourhood of the ora serrata, it is wise to consider briefly the causes and results of vitreous detachment. It may be due to the shrinkage of inflammatory products and these are most commonly the result of cyclitis. The vitreous may be detached in retinitis, choroiditis and myopia, and it may be pushed forwards in subhyaloid haemorrhage, or drawn forwards by a shrinking vitreous haemorrhage. The detachment may be complete when it is globular. More frequently, however, it is incomplete and tent-shaped with its apex at the disc, or at the scar round a perforating wound, or an intra-ocular foreign body. Occasionally an antero-lateral detachment is found in which the vitreous is separated from the suspensory ligament.

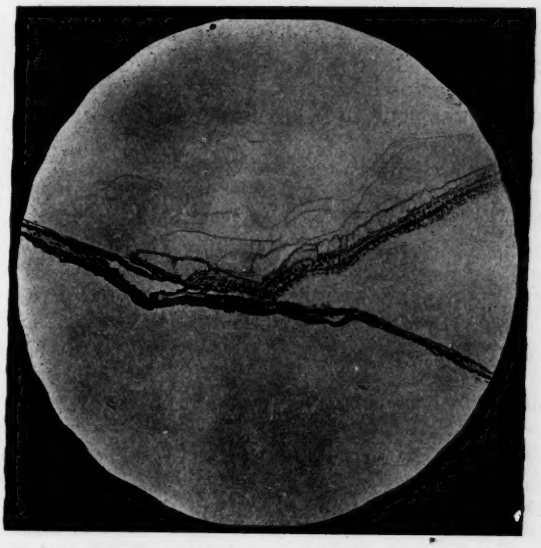
The Lausanne and the Zürich schools particularly emphasize the frequent appearance in both senile and highly myopic eyes, with and without retinal detachment, of a fine annular opacity in front of the disc which is due to a tearing away of the vitreous. This appearance is one sign of vitreous detachment which is a frequent forerunner of retinal detachment. Vitreous detachment is however more frequently associated with detachments of the upper retina than with dialysis. Yet the alteration in form and position of holes in the "posterior hyaloid" after cauterisation, reveals the influence that vitreous contraction may have on adherent retina.

The influence of less obvious vitreous changes is not yet understood. But the ability of this highly turgescent gel to lose its water content attaches fresh interest to the effects of slight trauma and general disorders and their ability to produce vitreous and retinal detachments.

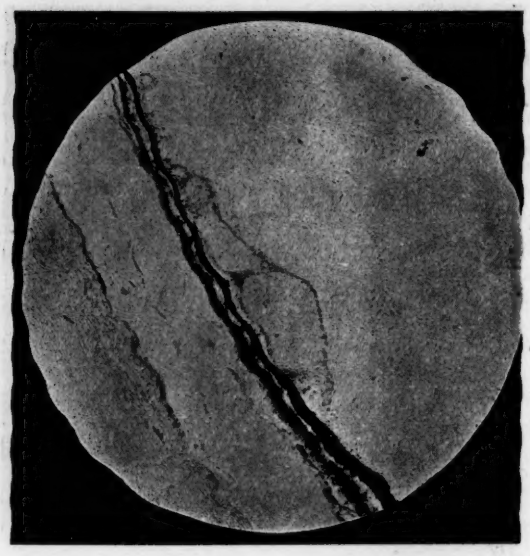
Pathology of the Ora Serrata and its Neighbourhood

Cystoid degeneration of senile origin affects first and mainly the anterior margin of the retina. It first appears immediately behind the teeth of the ora serrata between the ages of 16 and 20 years. Kuhnt (1881) found that the affected area was of greatest breadth on the temporal side. Zeeman (1912), after examining ten cases came to the same conclusion. The breadth of the affected area varies from 0·5 to 7·0 mm. Leber considered that clinical recognition of this degenerative change was scarcely possible.





Microphotographs of aged chimpanzee's eye to show attachment of vitreous remnants to periphery of the retina and cystoid degeneration. Notice that the artificial detachment ends at the ora serrata. The lower photograph shows complete separation of the retina from its pigmented epithelium. Beyond the ora serrata the pigment has detached with the pars ciliaris.



Cystoid degeneration of periphery of human retina.

Even if it was situated more favourably for ophthalmoscopic recognition he thought that the transparency of the changes would make this difficult. Macroscopically one observes a network of raised gray lines. The extent and complexity of this appearance varies greatly in individuals.

Leber considered that the senile form of cystoid degeneration was purely a regressive change. The absence of venous congestion and of real oedema shows that inflammation plays no part. "As the retinal lymph escapes along the lymph tracks which accompany the vessels a congestion of them will set in earliest at the extreme periphery of the retinal capillary net where the pressure acting on the lymph from behind is smallest—as Iwanoff suggested in 1869." (Leber.) The good state of preservation of the retina and the early age of onset suggest that there is no primary degeneration of cellular tissue.

Dufour and Gonin (1906) found that there is a peripheral restriction of the visual field in old age. Leber considered that the rareness of this finding suggested that the restriction was not due to cystoid degeneration.

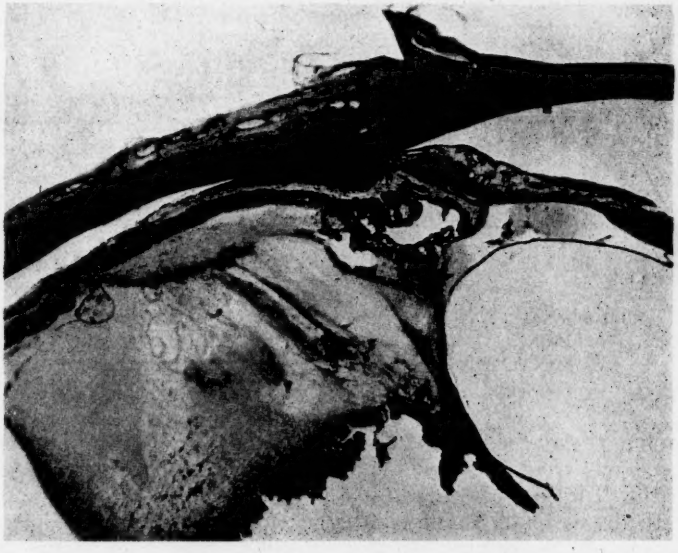
When cystoid degeneration occurs as a result of retinal disease, whether due to toxins, trauma or circulatory upset, it is scattered and not confined to the periphery. Leber (1916*a*) shows it in thrombosis of the central retinal vein, in renal retinitis and in

exudative retinitis. It is also found in all forms of retinal detachments, in glaucoma, in iridocyclitis, in retinitis pigmentosa and choroido-retinitis, and in forms of slow degeneration that produce staphylomatous changes and phthisis bulbi. In such disorders the spaces, which are larger, tend to coalesce forming blisters which contain clear fluid, and project from the external surface of the retina. Lawson (1869) observed eleven such prominences in one globe. They may be 6 to 8 mm. in diameter. When a large area is affected they may simulate a retinal detachment. Occasionally the appearance has aroused suspicions of tumour formation and the globe has been removed. (Treacher Collins, 1890.)

Cystoid degeneration of the retina has been found in association with sarcoma of the choroid. It is apt to occur whenever there is congestion, and either excessive formation of fluid or decrease in the escape of such.

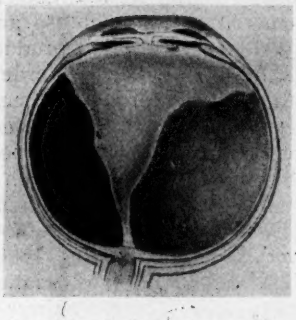
Influence of Cyclitis

In the past anterior dialysis of the retina was more commonly seen by pathologists than by clinicians. This was partly due to the fear of sympathetic inflammation after trauma and old disease

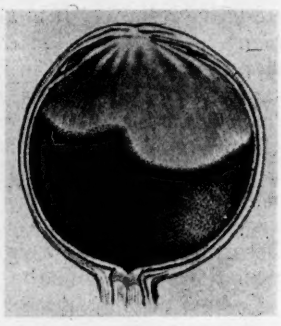


Microphotograph of ciliary region of human eyeball to show the extension of exudate in cyclitis. The routes taken are towards the anterior and posterior chambers, into the vitreous and along the anterior surface of the retina. Later the ciliary body and the periphery of the retina are drawn centrally.

Photograph of Plate VIII, Fig. 1, *Trans. Ophthal. Soc. U.K.*, Vol. XXI, p. 210. Leslie Buchanan. Cyclitis: A study of inflammatory exudations into the vitreous body in cases of cyclitis.



Detachment of the vitreous after an injury. Notice intact attachment at ora serrata.



Detachment of the vitreous from gonorrhoeal ophthalmia and consequent phthisis bulbi.

which was not as great as it is to-day and so the removal of eyes was at times unduly postponed and examples of secondary dialysis developed. It is also due to incomplete clinical examinations.

The ophthalmoscopic picture shows the retina as if drawn backwards. This appearance led to the early belief that posterior traction

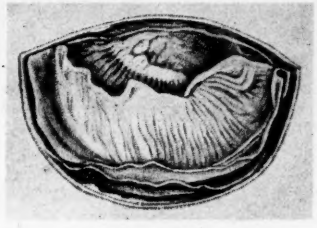
DIAGRAM REPRESENTING. 1. Spread of cyclitic exudation. 2. Contraction of cyclitic membranes with tearing away of pars ciliaris retinae and release of retina. 3. Passage of fluid through dialysis.

produced the dialysis. However in most instances the impelling force acts from in front. The ciliary region once again appears as the "cockpit" of ocular disease.

In the early stages of cyclitis an effusion of fluid and later an escape of cells occurs. In acute cyclitis, even a few hours after an injury, leucocytes escape from the ciliary body and pass into the vitreous, both posterior and anterior chambers, and between the epithelial cells of the retina. The spread posteriorly over the retina is of particular interest. The lymph secreted is readily

coagulable and the amount of fibrin varies greatly. The exudate in the posterior chamber is not as readily removed as that in the anterior chamber. Much of it generally remains to become organised. The tendency to organisation is greatest in the spaces in which the fibres of the suspensory ligament lie. Here even as early as the eighth day fibrous organisation may begin to appear. (Buchanan, 1901.)

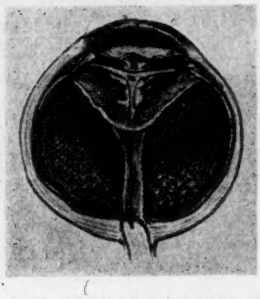
In later stages a thick transverse membrane is found stretching centrally from the ciliary region on each side. From it processes may be found running to the retina. "During the contraction



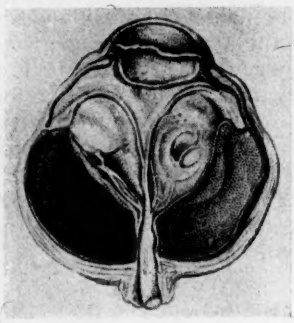
Transverse cyclitic membranes projecting from region of ora serrata into vitreous.

which always accompanies consolidation of such tissue the ciliary processes are drawn inwards, and the whole ciliary body is often detached from the sclerotic, except at the spot where the ciliary muscle is inserted into the sclerotic just behind the angle, leaving a large supra-ciliary space traversed by fine, more or less concentric laminae of pigmented stroma. The retina also may be detached by

Perforating wound with connective tissue uniting iris, ciliary body, lens and anterior part of retina and vitreous. A funnel-shaped detachment of the vitreous and a folded retinal detachment end at the ora serrata but the detachment of the anterior choroid and the ciliary body spreads forwards to the base of the iris.



Sympathetic cyclitis with T-shaped membrane formation containing a fragment of new bone. The retina is firmly attached to this membrane and is detached resembling a funnel.

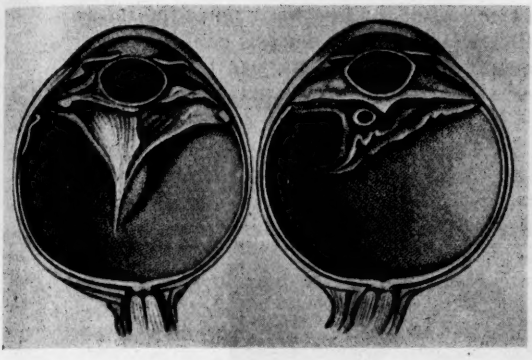


Cyclitis with wedge of dense fibrous tissue filling up space between lens and retina which is detached as far as the ora serrata.

Photographs of plates from the Atlas of Pagenstecher and Genth.

the same process, the globe finally shrinking and entering into the condition known as phthisis bulbi." "The part nearest the ciliary body naturally organises first since it is from this part that the fibroblasts are derived." Parsons (1908*a*). Parsons in his work "Pathology of the Eye," Fig. 256, shows the manner in which traction, after cyclitic organisation, can retract the periphery of the iris, draw the ciliary processes inwards and detach the retina. (See also Collins and Mayou, 1912.)

The relationship of these findings to anterior retinal dialysis is made clear by a brief survey of two reports made by Leber. Leber's detailed report (1916*b*) of his histological investigations of a case reported by Nordenson (Nordenson's 4th case) proves that traction from the ciliary region after cyclitis can produce an extensive anterior dialysis. The patient was a woman, aged 52 years, in whose right eye a retinal detachment had suddenly appeared. An extensive avulsion from the ora serrata was observed ophthalmoscopically. Owing to the onset of acute inflammation and diminished tension the eye was removed six weeks after the appearance of the detachment. The retina was obliquely and almost completely torn away close to its anterior limit. Only a short fragment (1 to 1·5 mm. long) was left adherent to the pars ciliaris at which point the latter was detached. A layer of tissue which was attached to the orbiculus ciliaris all round, ran transversely across the globe. This represented the vitreous and was typical of the appearance described by Pagenstecher (1876) as anterior and posterior vitreous detachment. The vitreous which was still attached at the optic disc was drawn



Detachment of vitreous showing transverse cyclitic membrane.

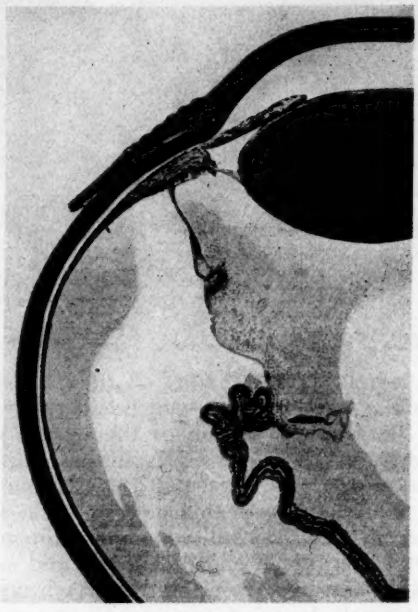
Kerato-iritis with glaucoma and retinal detachment. Notice nasally the shrunken vitreous and the cyclitic membranes which are drawing the detached retina forwards.

Photographs of plates from the Atlas of Pagenstecher and Genth.

forwards into a stalk. The structure of the retina itself was surprisingly normal. A cellular layer which had grown from the pars ciliaris, over the anterior portion of the retina, was obviously similar to the earlier described "pre-retinitis," which was considered by Leber to play so great part in the production of many detachments. This layer appeared as if it could have produced traction on the retina. It was still adherent to the anterior margin of the tear but posteriorly it ended as a free and extended shred. A marked and peculiar hypertrophy of the detached part of the pars ciliaris was present. Anteriorly it was of normal thickness but where it bordered on the retina it was a compact membrane of elongated and proliferated cells and was at least as thick as the retina. The cells were in many layers and anteriorly were formed into clusters between which small gaps were found which were bridged over by fibres which strove to reach one another in arcade-like form. Only the adjacent retina was very irregular in structure. In the presence of vitreous liquefaction and the absence of tissue on the posterior part of the retina which could produce traction, it could be assumed that the ciliary proliferations had caused the dialysis. The origin of the whole process was certainly a chronic cyclitis. The structure of the retina itself was normal. It was the most recent detachment of this kind to be investigated microscopically.

Leber (1916*c*) reported another of Nordenson's cases. The eye was myopic (8 D.) and was excised fifteen months after the appearance of the detachment. During the first twelve months the retina

went back into position twice. After the final recurrence the retina became widely detached below and a large dialysis could be seen. After enucleation a complete anterior dialysis was found at the transition line into the pars ciliaris, and the retina was pulled far



Spontaneous retinal detachment in myopia. **(Case 1, Nordenson.)** ***Anterior retinal dialysis.*** **The pars ciliaris is detached from the choroid as far as the ciliary processes, and is firmly adherent to the detached vitreous. Its posterior end is torn from the retina which has been drawn back and lies in folds which are adherent to each other. Joining the ends of the pars ciliaris and the retina and represented in the illustration merely as a line there is a layer of newly-formed tissue on the surface of the thickened vitreous.**

Photograph of illustration 248 in ***Graefe-Saemisch-Hess Handbuch***, 1916.

backwards. The pars ciliaris was widely detached from the ciliary body and pulled perpendicularly inwards. On its anterior or inner surface lay the detached vitreous with serous exudation behind it. A marked proliferation of ciliary cells extended from the posterior end of the pars ciliaris to the anterior surface of the vitreous. From this an offshoot of cellular tissue ran to the retinal folds, uniting them as it spread between them. At first it appeared that this tissue had played some part in the production of the dialysis. Later,

however, it became apparent that this tissue had developed after the retinal tear. Such a proliferation into the scar tissue is common in all types of cyclitis. It may occur from the pars ciliaris retinae or from the retinal epithelium itself. (Parsons.) It was concluded that the traction was from in front, that is from the pars ciliaris. As in the previous case the pars ciliaris was hypertrophied and Leber considered that slight traction produced the initial and transient detachment. The extensive dialysis was produced later when cyclitic membranes had become more powerful.

It is of interest to note that this patient was troubled with exceedingly disturbing subjective light manifestations. These arose fifteen months after the appearance of the detachment, and they persuaded the surgeon to remove the eye when the vision was "fingers at a close range." Leber was inclined to consider that they were due to the presence of a rare retinitis externa. Opposite the site of the tear and towards the posterior pole the outer retinal surface was very uneven and thickened. The outer granular layer and the rods were most affected. As the choroid and the pigmented epithelium were normal this change was considered to be secondary.

The examination of several globes convinced Leber that in purulent cyclitis a proliferation of connective tissue in the anterior vitreous, and of epithelial cells on the retinal surface could produce detachment. One globe was removed two months after a cataract operation. Richly cellular tissue occupied the anterior vitreous. The vitreous was partially detached from the retina and the intervening space filled with serous fluid. A membrane of variable thickness had detached the retina and drawn it into folds. A similar membrane was found on the external surface of the retina. It is conceivable that such a condition may tear the retina away at the ora.

Influence of Trauma

Traumatic cyclitis. It is of value here to emphasize one possible result of contusions and the milder forms of trauma. The ciliary body and particularly its temporal portion is exposed to trauma. Though the typical signs of cyclitis, particularly keratic precipitates are rarely seen after contusions, haziness of aqueous and vitreous, due to exudation from the iris and the ciliary body, are commonly seen. "Precipitates on the cornea are evidence usually of a subacute or chronic process." (Parsons.) However, both exudation from increased capillary permeability and low tension from the reverse state, are early results of cyclitis whether traumatic or not. Probably a slight trauma by producing a bruising effect can start the mechanism that produces anterior dialysis.

Influence of Trauma apart from a Cause of Cyclitis

Direct Injury. The retina may be torn at the ora serrata in one of several ways when the eye is perforated by weapon, instrument or missile. It may be a direct result of the injury, and part of the wound which in turn has affected sclera, choroid and retina. Clinical recognition of such a dialysis is unlikely, as the eye is lost or its opaque media obscure the defect. Histological examination is the means by which this condition has been studied. Treacher Collins (1917) referred to several specimens in the Moorfields Hospital Museum which showed a separation of the retina at the ora serrata as the result of blows. Butler (1917) described an eyeball in which, after a blow from the bough of a tree, he found a dialysis of one third of the ora serrata.

Scheffels reported a man, aged 35 years, whose left eye was ruptured by a thrust from a cow's horn. A rupture at the sclerocorneal junction was found. After enucleation and examination nine weeks later an almost complete dialysis was present and the retina was rolled inwards. There was dialysis and partial prolapse of the iris. There was no trace of lens or vitreous and evidently the expulsion of these tissues had caused traction on the ora serrata. As a result the pars ciliaris retinae was absent except for a small area which corresponded approximately with the locality of the wound. Only at this point did the retina retain its connection with the ora serrata. Elsewhere it was dialysed and detached from the choroid.

Leber (1916*d*) considered it firmly established that retinal detachment could occur in healthy eyes in consequence of severe contusions which produced serous extravasation. In such cases the contusion always produced a retinal tear which lay usually in the region of the ora. Dufour, Gonin and Wagenmann supported Leber in regarding the tear as the actual cause of the detachment. Many authors considered that a paralysis-like state of the choroidal vessels was produced which permitted the collection of inter-retinal fluid. A similar explanation was advanced for the shallow detachments associated with commotio retinae. Leber referred to twelve cases of detachment following severe contusion. In ten of these one or two tears were present in the anterior part of the retina, and in six an extensive avulsion was found. In two cases Leber considered that tears were present though not found. Concerning the first ten cases Leber wrote that the choroid could be clearly seen, that no blood was seen to pass through into the vitreous and that no diffuse vitreous opacity or vitreous haemorrhage was found. In two of his series Leber observed a choroidal rupture. These

were due to injury from a blunt arrow and a spent grain of shot. The remainder resulted from a blow from a key, a pole, a falling branch, the head of a horse, and a piece of timber. In all the blow was severe, but as a rule it left no objective signs behind.

Scheffels (1891) reported two patients who developed anterior retinal dialysis after trauma which did not produce any abrasion or scar on the eye. The first was a man, aged 35 years, who was examined two days after an injury with a stick. Only the upper lid showed signs of injury and they were slight. Two months later, when the blood and the vitreous opacities had cleared, the fundus was found to be normal, except at the inferior periphery where the retina was hazy. A corresponding defect in the upper field was found. The upper lid was injured and an upper iridodialysis was present, but it was the lower part of the retina that had probably separated from the ora. Thirteen years later, when the patient returned for a "follow up" examination, a hypermature cataract prevented a fundus view. The second patient was a woman, aged 38 years. She, whilst pruning a vine, was struck in the left eye by a flying twig. Ten days later a greyish white wavy mass of folds and coils was seen through the pupil. No retinal vessels were seen, for a complete dialysis had occurred, and it was the rod and cone surface that was exposed. The choroid in all its details could be clearly seen. Scheffels stated that these two instances of dialysis, with intact zonula and lens in its normal position, were unique in the literature.

A slight injury may be sufficient to cause dialysis in predisposed eyes. In one of Leber's series, predisposition was suggested by the existence of blindness in the second eye from a probable detachment. In another the eye was myopic and the trauma slight. In Scheffel's last case a knock from a twig when pruning vines was sufficient to produce dialysis. It appears likely that in a predisposed or myopic eye a severe bodily injury may produce a dialysis. Baquis' patient was thrown from a horse. He had 14 dioptres of myopia and it was possible that contusion produced a retinal dialysis. No detachment appeared at first but, later, vitreous passing through the opening pushed forwards the retina. Knapp (1931) found an inferior dialysis from 6 to 8 D. D. in length, in a woman's eye which had been struck by her child. After cauterisation it recurred but on conservative treatment it largely re-attached. H. Müller (1931) reported a patient who, by falling seven feet, had fractured his skull and produced a long tear of the extreme periphery with a detachment. In Fuchs' patient (1920) the retina was completely detached and the dialysis was just in front of the ora serrata. In places the tear extended to the posterior edge of the corona ciliaris. Fuchs considered that the membrane of proliferated tissue that was present did not supply the traction that

produced the dialysis, but that this was due to trauma and unusual strength of the anterior border layer of the vitreous. The patient was a boy, aged 11 years, who, during the three months prior to enucleation, received two injuries to his left eye which was congenitally myopic. Haitz (1931) wrote concerning a man, aged 49 years, who fell on his back and developed an anterior dialysis. Haitz considered that the fall had jerked the vitreous backwards and torn it and the adjacent ciliary epithelium from their ciliary attachments and so released the retina. A number of cases have been reported of extensive anterior dialysis with haemorrhage into the vitreous. A branch of a tree caused the injury in Bäurlein's case (1871), and broken glass in a patient of Vossius (1901). The haemorrhage may obscure the actual retinal rupture especially if the choroid is torn away too. When the anterior part of the choroid as well as the retina is torn by a severe contusion, the tear is found in the vicinity of the ora serrata.

Leber considered that detachments, which appeared during the first two months after an injury, were probably due to a peripheral tear. Such a tear, especially if small, is easily missed as long as the retina is flat and undetached. The persistence of small tears without detachment is considered by Leber (1916*e*). Even large tears may remain for some weeks before producing a retinal separation. A patient reported by Cramer (1905) illustrates this point. He was aged 59 years and he received a severe blow on his only useful eye with a threshing flail. There was no disturbance of vision for five weeks, when, preceded by a period of considerable visual vibration, blindness rapidly developed. An extensive detachment was found with an irregular tear in the extreme temporal periphery.

Influence of Indirect Trauma

Rupture of the various ocular tissues at their weakest spot may result from indirect trauma. The typical scleral rupture is concentric with and just outside the limbus. A partial or complete iridodialysis with aniridia or retroflexion may occur. The characteristic rupture of the ciliary body is a separation of the circular fibres from the longitudinal or of both from the sclera. [L. Buchanan (1903). Treacher Collins (1892)]. The suspensory ligament may rupture and occasionally so slightly that no dislocation of the lens occurs. The most common choroidal rupture nearly always occurs between the macula and the optic disc and is concentric with the margin of the latter. Choroidal ruptures, unlike the main retinal damage, are not situated at the macula; possibly the presence of the disc is a determining factor. Hughes found that 84 per cent. of choroidal ruptures developed temporal to the disc which in most cases meant

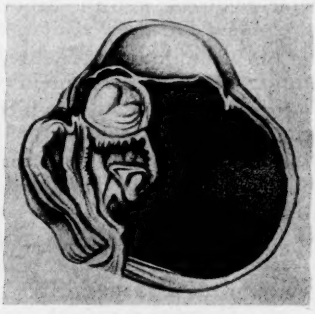
nasal to the visual axis. The retinal effects of indirect trauma are mainly found at the macula where oedema and later a hole are frequent results. If a tear is found peripherally, it is as a rule at the ora serrata but such a rupture is not common apart from perforating wounds.

Dialysis at the ora therefore appears, after indirect trauma, as one of a series of ruptures at the weakest spots of different tissues. The occurence of a rupture of a more anteriorly situated tissue probably lessens the risk of rupture of a more posterior layer. In a globe described by L. Müller the only part of the ciliary body not detached from the sclera was that at the site of iris rupture. (*Parsons, 1908b.*) Similarly in Nordenson's fourth case the only part of the pars ciliaris retinae, which was not torn from the ora serrata, was detached.

Traction Scarwards with Dialysis of Antipodes

A perforating wound may alternately produce a dialysis by cicatricial contraction towards the scar. The part of the ora serrata that is diametrically opposite the scar is that which is usually

Partial anterior dialysis six weeks after a perforating wound on the opposite side of the globe.



Anterior dialysis after perforating wound. All contents of eye including temporal half of retina and the lens are drawn towards scar in the nasal sclera.

Photographs of plates from the Atlas of Pagenstecher and Genth.

affected. It has been seen that the traction in cyclitis was inwards and forwards. After a perforating wound a new direction—scarwards—is added to the lines of traction.

Martin (1929) reported a globe which had been injured by a knife in the lower nasal part of the sclera. The contraction of cyclitic membranes had torn the temporal retina away at the ora.

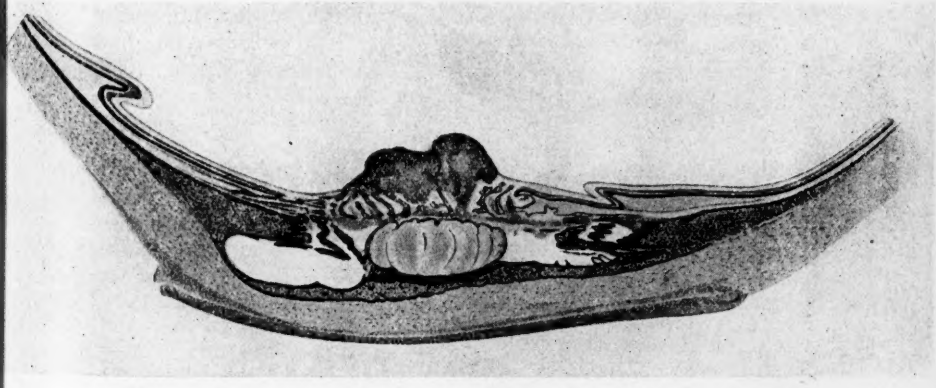
The lens too was drawn nasally. Poos (1928) reported a boy, aged 7 years, who was struck in the left eye with a knife. Five weeks later the eye was injured when playing football and three months later it was removed. The lens was found to be drawn towards the scar. The ciliary processes near the wound were embedded in cicatricial tissue and folds of detached retina. Posteriorly the ciliary epithelium was drawn into long thin cords of cells. The completely detached retina had even been torn from its attachment at the ora serrata. This dialysis was diametrically opposite the scar. "Attached as the vitreous is, not only to the lens anteriorly but to the retina behind, it is easily seen how a blow upon the eye would precipitate retinal detachment" and dialysis. Wintersteiner (1901) reported a child, aged 7 years, who developed irido-cyclitis after an injury. The retina was separated at the ora serrata on the opposite side of the globe to that where the scleral scar was found. He considered that direct traction had not caused the dialysis as the retina was in loose folds and not stretched. Probably the vitreous base had drawn the pars ciliaris retinae forwards until it separated from the retina and the latter was released.

Lawson (1917) reported the story of a lieutenant, aged 23 years, who at the Dardanelles was struck on the left side of his face. His vision was 6/24, and the fundus appeared normal but the vitreous was clouded and showed a large grey mobile opacity. Three months later his vision failed suddenly. "A fine lace-like veiling was found hanging detached over the lower two-thirds of the picture, leaving a gap above it through which the choroid and its vessels were plainly seen." X-rays revealed a minute foreign body near the ciliary body temporally. After rest the lower visual field improved but the upper field remained very defective. Four weeks later the retina was found to have largely re-attached and a foreign body was found high on the temporal side. Treacher Collins reported the pathological findings. The vitreous was almost absent, only a small area lay posteriorly. The retina was detached and formed a puckered membrane in the centre of the globe. After the removal of a grey gelatinous coagulum, which completely filled the space between the retina and choroid, it was found that the retina and a portion of the pars ciliaris had been torn from the ciliary body, both above and below. The only portion of the peripheral retina to retain its attachment was on the temporal side. The entire pars ciliaris and the suspensory ligament were drawn towards the centre and the temporal side of the globe. A conical projection joined the outer surface of the retina to an atrophic area of the choroid on the temporal side. The foreign body was found between the lower margin of the lens and the detached pars ciliaris. The contraction along the track of the foreign body in the anterior vitreous, had probably dragged the posterior part of the pars

ciliaris and the adjacent retina inwards towards the centre of the globe. It appears therefore as if a scar lying behind the ora may lead to sufficient cicatrisation to tear the retina at the ora. In Constentin's case (1904), four weeks after a puncture wound in the inferior temporal quadrant of the equatorial zone, the upper half of the retina was torn away and flapped over the lower half.

Supertraction of the Retina over the Ciliary Body

The retina may be drawn forwards over the ciliary body by contracting scar tissue following lens injuries or spontaneous hyalitis. The anterior edge of the retina may even reach the axis of the eye. Delicate membranous extensions appear to extend towards the lens. These draw the retina forwards. The pars ciliaris retinae at times may be affected so that it is separated from the orbiculus ciliaris. It and the ora serrata too may be drawn forwards. Leber described this form of retinal supertraction in eyes which were injured by a knife, perforated by an ulcer or affected by a metastatic vitreous abscess during an exanthem. In another eye the injury was a corneal perforation due to a peck from the beak of a cock. Newly formed tissue surrounded the lens and was connected with the ciliary body and the retina. The cells of the pars ciliaris retinae were drawn out into long fibres. Here the traction had been so great that the retina was torn at the ora serrata. The anterior margin of the retinal tear was caught forwards in tissue near the ciliary body, whilst the posterior margin was entangled in newly formed tissue near the lens margin.



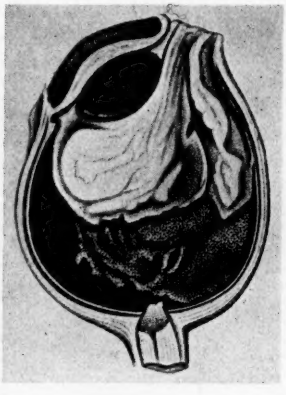
Supertraction of the retina and pars ciliaris over the ciliary body from the contraction of fibrous tissue behind the lens.

Photograph from *Graefe-Saemisch-Hess Handbuch*.

Römer (1901) wrote that only one case of complete retinal separation at the ora serrata had been described histologically. This had been reported by Velhagen (1900). The patient was aged 17 years, and when 5 years of age his left eye had been injured by a shoemaker's punch. On microscopical examination the corneal scar was not found. The entire pars ciliaris was detached and folded. The retina was a shrunken mass resembling a spherical tumour on the optic disc. It was separated from the pars ciliaris by a space filled with serous fluid. Leber afterwards studied the specimens and stated that it was only the second case of dialysis from supertraction that he had seen. He considered at first that the separation of the retina was due to traction from the posterior part of the globe. However as neither connective tissue in the retina, nor any other substance to cause traction in this direction, was found, he concluded that connective tissue which was present in the neighbourhood of the shrunken lens had drawn forwards the pars ciliaris until it completely separated from the real retinal tissue which then contracted posteriorly. A similar condition is shown in Pagenstecher and Genth's Atlas (1875). Unfortunately no history accompanies the report.

Hernia

Leber (1916*f*) reported the globe of a child, aged 2 years, which had become ectatic after discission of a congenital cataract. After an iridectomy a slight vitreous loss occurred and on the following day a white mass of tissue was found in the wound. 16 days later



Hernia of infected contents through perforating wound. Retina is torn from the ora serrata and the optic disc.

Photograph of plate from the Atlas of Pagenstecher and Genth.

the eye was removed. Examination of this eye showed extensive choroidal detachment, and the vitreous space, which was markedly reduced, was filled by the retina which had become folded over many times. If a more extensive hernia occurs a dialysis may ensue.

The retina may be prolapsed into a wound, but this is much rarer than vitreous prolapse. Leber reported an eye with such a prolapse after injury. It was excised three weeks later. A gaping wound affected the whole of the cornea. The nasal half of the retina was missing. The lens and most of the vitreous had escaped at the time of the injury and the completely detached retina was separated at the ora on the nasal side. Its anterior end replaced the missing iris and was caught into the scar.

Stellwag in his "Ophthalmologie" reported instances of detachment at the ora following penetrating wounds of the globe and perforating corneal ulcers in which the lens and vitreous had been extruded. (Scheffels.) Evidently in Berger's case (1887) dialysis followed a blow from a pitchfork when the retina was prolapsed into the anterior chamber.

A similar result may complicate an iridectomy or a cataract operation. If conditions are suitable merely the escape of aqueous may be sufficient to excite an expulsive haemorrhage. Such a catastrophe is most apt to occur in ectatic globes and in the presence of vascular degeneration. Beer points out that dialysis may follow operative interference in glaucoma if due to a choroidal tumour. (Scheffels.) In Pagenstecher's collection there were two globes in which an iridectomy for this form of glaucoma had been followed by choroidal haemorrhage, inclusion of the retina in the wound and dialysis at the ora serrata. This cause of dialysis must be separated from instances due to prolonged traction from long-standing scars without prolapse. See Römer's (1901), Vossius' (1901), and Wintersteiner's (1901) cases.

Needling

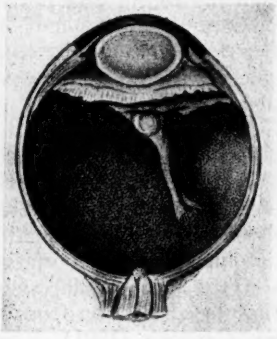
If the membrane that has formed after a cataract extraction is firmly adherent to the retina near the ora serrata, a tear in this neighbourhood may occur during a needling operation. Fuchs (1877) described such a case. It followed an attempt at discission and reclination. The dialysis was visible through the coloboma. Leber stated that he had seen an almost similar case.

Contrecoup

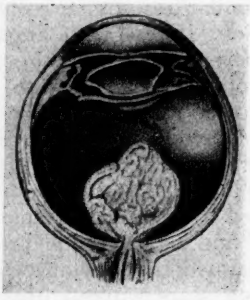
A rare type of dialysis is that which is due to contrecoup when an explosive force causes the trauma. Then the retina may suffer far in excess of the choroid and sclera. In a classical case which

will be briefly referred to, to the tear at the ora, which was complete, was associated with a small rupture of the globe. The scleral wound was above the limbus and due to an explosion. Römer (1901) who reported the condition, considered that the remainder of the retina was separated at the ora by contrecoup. Clinically the iris and lens were invisible having been driven through the scleral rupture. A cord of tissue, which ran towards the scleral wound, consisted of the retina which was torn completely away at the ora. Here and there a vessel was visible as one studied the outer surface of this cord. The pigmented retinal epithelium was exposed lying intact on the choroid. At the time Römer's case was clinically unique.

Anterior dialysis is comparable with posterior dialysis which however must not be confused with avulsion of the optic nerve. In Paul's case (1905) of posterior dialysis, a fall on the face occurred



Complete posterior dialysis of the retina. Penetrating foreign body produced dense connective tissue behind lens which united ciliary body and detached the retina.



Complete anterior dialysis of the retina. The rolled up retina resembles a tumour lying on the optic disc.

Photographs of plates from the Atlas of Pagenstecher and Genth.

in which the eye was struck by a stake. This caused tearing of the retina, and its vessels from the disc. In Dahrenstadt's case (1892) a similar injury produced a steep but local detachment around the disc but no dialysis.

(To be continued)

COLOURED AREAS IN THE SCLEROTIC

BY

C. H. USHER

ABERDEEN

THE occurrence of coloured areas in the sclerotic in some cases of melanosis of the eye is well known. The colour of these areas has been variously described as violet, purple, slaty-grey or brown. Bourquin in his comprehensive paper, in 1917, says that the scanty and contradictory accounts of the course of melanosis do not allow us to decide whether the sclerotic spots are progressive or stationary, and that most authors have seen their patients only once, and they tell us nothing as to whether the spots increase in size, or whether new ones are added. In expressing this opinion, Bourquin had only five cases under consideration, those of Collins, Coats, Fleischer's two cases and one of his own. The case described by Cerise and Chéné is mentioned but is not considered by him in his discussion of the stationary or progressive character of this condition. In 1911, Cerise and Chéné showed a patient with an eye affected for three months, following a difficult confinement. The sclerotic presented irregular slate-coloured spots more or less pigmented. During these three months the pigmented spots became larger. Rochon-Duvigneaud and Dupuy-Dutemps were of opinion that the sclerotic pigmentation was congenital. Since 1917, Hildesheimer in 1920 showed a case of congenital melanosis of conjunctiva and sclerotic in which the pigmentation had gradually increased. The Friedenwalds in 1925 found the condition unchanged in a girl, aged nine years, whom they had observed for four years. The sclerotics showed bluish, almost purple discoloration. In 1913, Dr. Fridenburg made a coloured drawing of the eye of Davis' case, a boy, aged 11 years, with two slate-coloured patches in his right eye; in 1927 he saw the case again and found practically no change. The cases which Bourquin had under consideration were as follows. (1) A case of melanosis of the uvea and sclera, with areas of brown pigmentation in the sclerotic described by Collins in which the melanosis had not altered from the time he had seen it ten years previously. (2) A case reported by Coats in which the family practitioner saw a small spot on the sclerotic shortly after birth, at four years of age the spot was larger, at fifteen years of age the pigmentation of sclerotic was much greater. Two cases of Fleischer. (3) The first case, a female, aged 3 years 6 months at first examination, showed no considerable change in seven years. (4) In the second case, a female, aged two years when first seen, pigmentation of the sclerotic had advanced in two years. (5) Bourquin's case, a female,

aged 12 years, in which the spots remained unchanged for two years.

In view of these conflicting results and the dearth of reliable observations a few cases seen by me in the years 1910 to 1925 were recently re-examined. By comparing the appearances with those seen at the first examination it was hoped to determine whether the coloured areas were stationary or progressive, whether they enlarge, increase in number, or change colour as does the iris in early life, and if so at what period the change occurs.

Of nine cases sought for six were found, one had died, one is abroad, and one could not be traced. At the time of the first examination a hasty sketch, and in case No. 7 a coloured drawing of the eye was made, which in conjunction with descriptive notes has been of use when comparing the then appearances of the sclerotic with those at the present time. The eyes were not originally examined with the purpose of comparing their appearance at a later date, but the data recorded at the first examination are sufficiently accurate to show whether any considerable change had occurred in the interval.

The notes of the cases preceded by a short précis of each are as follows.

The first case has the coloured sclerotic patches limited to one eye, which has a darker brown iris than the other eye and a more deeply pigmented fundus. With the exception of one area there is nothing to suggest that the purple patches altered in extent, number, or colour from the age of 7 to 18 years. In the darker iris which has a uniform appearance, except at the pupillary part, the usual surface markings are absent. Pigment spots are present in the skin on several parts of the body.

Case 1. April 16, 1921. Eva G., aged 7 years, a difference in the appearance of her eyes first noticed two years after birth and attributed to a fall down stairs.

EXAMINATION OF EYES: Ps. equal, contract to light, eye movements full, uncertain nystagmus on extreme lateral movements of the eyes, no ptosis, T.N. *Right eye:* sclerotic has no purple areas, iris dark brown, fundus dark, no choroidal vessels definitely seen, refraction H. *Left eye:* sclerotic has extensive purple areas on three-fourths of the ciliary region, down and out they are very faint, anterior edge of each area is well defined and situated at a distance of from 2 to 4 mm. from corneal margin, posterior boundary of each area is visible but not well defined as it merges into the normal colour of the sclerotic, conjunctival vessels are conspicuous and moveable over the areas; iris very dark brown showing little distinction from the black pupil; fundus darker than right fundus, much reflection from retina which has a grey appearance; refraction H. Hair of head medium brown with tinge of red, eyebrows dark brown, eyelashes very dark brown; skin, medium shade of colour, has a number of pigmented spots on several parts of body. Patient is fifth born in a sibship of six. No relative is known to have the eye condition that she presents. Father's iris blue, mother's brown. Father says that the children all took after their mother as regards eye colour.

RE-EXAMINED March 1, 1932, occupation printer's feeder, health good. *Right eye:* sclerotic has no purple areas; iris brown with normal surface markings; V. 6/6 HM. 0·50 D., 1 J. *Left eye:* sclerotic purple areas have not altered in distance from corneal margin, excepting possibly an area at inner part which now nearly reaches corneal limbus, their posterior boundaries are visible, ocular conjunctival vessels appear as on first examination; iris, much darker brown than in other eye, surface uniform from absence of surface markings, except in pupillary region, a few minute brown elevations present at outer part of iris and near pupil, V. 6/6, not fully, with −0·25 D. = 6/6, 1 J., field of vision full; Ps. equal, contract to light, no nystagmus; skin not dark.

The second case has unilateral violet sclerotic patches in the eye with darker brown iris and fundus. During a period of more than 20 years, from 1911, when she was 3 years of age, to 1932, the violet colour appears to have extended, for at the first examination the coloured area was separated from the cornea by normal white sclerotic, whereas at the second examination it had reached the corneal margin both above and below. Support is given to the accuracy of these observations by the mother's statement, given quite voluntarily, that the affected areas had become darker and had extended. Numerous minute brown smooth elevations cover the surface of the darker iris.

Case 2. April 29, 1911. Jessie R., aged 3 years, diagnosis cyanosis bulbi.* Her father noticed a mark on lower part of sclerotic shortly after birth and thinks the purple marks on left sclerotic have become more conspicuous and the brown of left iris has got darker since birth. He cannot say there was any difference between the right and left iris at birth. EXAMINATION OF EYES: *Right eye:* sclerotic normal; iris dark brown; fundus normal, refraction H. *Left eye:* sclerotic has a diffuse violet area separated from cornea by white normal sclerotic, normal coloured sclerotic visible beyond posterior boundary of the violet area; iris diffuse black-brown; fundus much darker than the other; refraction H. no moles anywhere on the skin.

RE-EXAMINED February 16, 1932. Occupation 'cellist. Hair of head, eyebrows and eyelashes dark brown, skin darker than that of mother and sister; Ps. contract to light. *Right eye:* sclerotic normal; iris brown with normal surface markings, no nodules; fundus, choroidal vessels visible. V. 6/6, HM. 0·75 D., 1 J. *Left eye:* sclerotic, violet areas surrounding the cornea extend to its periphery above and below, no part of the violet areas extends backwards to the equator of the eyeball; iris dark brown almost black and difficult to distinguish from pupil, on its surface are numerous minute smooth brown elevations seen best with the aid of a binocular loupe when she looks downwards. These elevations are present all over the iris surface; fundus darker than in other eye, no choroidal vessels seen, V. 6/6, HM. 0·75 D., 1 J., field of vision full. Father's iris blue, mother's iris brown. Jessie R. is sixth born in a sibship of seven. The first born, male, died aged 8 years, had blue eyes, no violet patches. The second, male, had brown eyes. The third, female, died, aged 7 years, had dark auburn hair, no violet areas. The fourth, female, died at 11 months, had blue eyes, no violet patches. The fifth, male, died, aged $1\frac{1}{2}$ years, had brown eyes. The sixth, Jessie R. The seventh, Betty R., aged 20 years, iris brown.

The third case, has a unilateral purple and brown coloured area in the sclerotic nearly completely surrounding the cornea and extending to its margin. When comparing a sketch of the eye made in 1920, at the age of 30, with the appearance seen in 1932, some extension of the coloured area downwards and nasalwards is suggested, but it cannot be definitely stated that an increase has occurred, no measurements having been taken. The light colour of the iris of this eye is to be noted, as a pale iris is unusual in this condition.

Case 3. September 8, 1920. Bella M., aged 20 years, domestic servant, complained of headache over left eye. EXAMINATION OF EYES: *Right eye:* sclerotic no note: iris pale green: fundus normal; refraction, after H. and C. drops, V. with +1·25 D. = 6/6; T.N. *Left eye:* sclerotic at ciliary region shows pigmentation in form of purple and light brown areas with unpigmented parts between. They extend to corneal margin except at inner part, conspicuous conjunctival vessels over the purple and brown patches above and below the cornea; iris pale green; fundus much darker than the right fundus and general colour of background is greyer than that in other eye; refraction, after H. and C. drops, V. with $\frac{-\ 0{\cdot}25\ D.\ sph.}{+\ 1\ D.\ cyl.}$ = 6/6 T.N.

RE-EXAMINATION February 24, 1932. She is married and has a daughter. *Right eye:* sclerotic normal; iris pale green; refraction, V. 6/6, HM. 0·75 D. *Left eye:* sclerotic, purple area which nearly completely surrounded the cornea in 1920 appears from comparison with a sketch made at the time to have extended downwards and nasalwards; conjunctival vessels as seen at first examination; iris

*A term used by Liebreich.

pale olive green above and blue below (examined in good day light), surface markings normal, no small brown nodules present, upper part of this iris is just darker than the pale green of the right iris; refraction, V. with +0·75 D. cyl. = 6/6, Ps., equal, contract to light; skin is blonde, hair, eyebrows and eyelashes brown, not dark. No relative known to have purple patches on sclerotic. Father has blue eyes, mother dark brown eyes. She is first born in a sibship of three. Two brothers have brown eyes. Her infant child has blue eyes.

The fourth case has unilateral purple sclerotic areas, and a darker brown iris and fundus in the affected eye. No alteration occurred in the appearance of the sclerotic between August 19, 1925, when her age was 45 and February 20, 1932.

Case 4. August 19, 1925. Annie C., aged 45 years, had difficulty in reading. EXAMINATION OF EYES: *Right eye*: sclerotic has purple areas in ciliary region extending from corneal margin upwards and two small circular purple areas near inner margin of cornea, in none of these is the colour pronounced; iris very dark brown; fundus darker than in other eye; refraction, V. 6/6, HM. 0·75 D. *Left eye*: sclerotic, no purple patches; iris brown with blue-green periphery; fundus normal; refraction, V. 6/6, HM. 0·75 D.; Ps., equal, contract to light; T.N. RE-EXAMINED February 20, 1932. *Right eye*: no change in appearance of the purple patches, sclerotic above the patches is yellower than usual, none of the purple areas extends backwards so far as the equator, conjunctival vessels conspicuous over the purple areas; compared with sketch made in 1925 the purple areas do not appear to have altered; iris surface markings show nothing unusual, no small brown elevations; fundus darker and retina has greyer appearance than in left eye; V. 6/12, with +1·25 D. = 6/6. *Left eye*: sclerotic normal; iris surface markings have same appearance as in right iris; fundus no change; V. 6/24, with +1·25 D. = 6/6; Ps., equal, contract to light, no signs of old iritis in either eye. Hair, eyebrows and eyelashes brown; skin rather dark, she mentioned a small dark spot on her back. No relative known to have coloured patches in the sclerotic. Her father had grey eyes and mother brown eyes. She is third born in a sibship of five. The first born, male, grey eyes; second born, male; fourth born, female; and fifth born, female, eyes dark; she, Annie C., has five children. First born, female, brown eyes, has two male children, the elder has brown eyes, the younger grey eyes; second born, female, has grey eyes; third born, female, has blue eyes; these two and the fourth born, female, are married with no offspring; fifth born, male, has dark eyes.

In the fifth case the coloured part of the sclerotic formed a nearly complete zone about 4 mm. in breadth around the cornea of one eye. The brown iris and fundus were darker in the affected eye. She had disseminated sclerosis, was examined only once and died two years later.

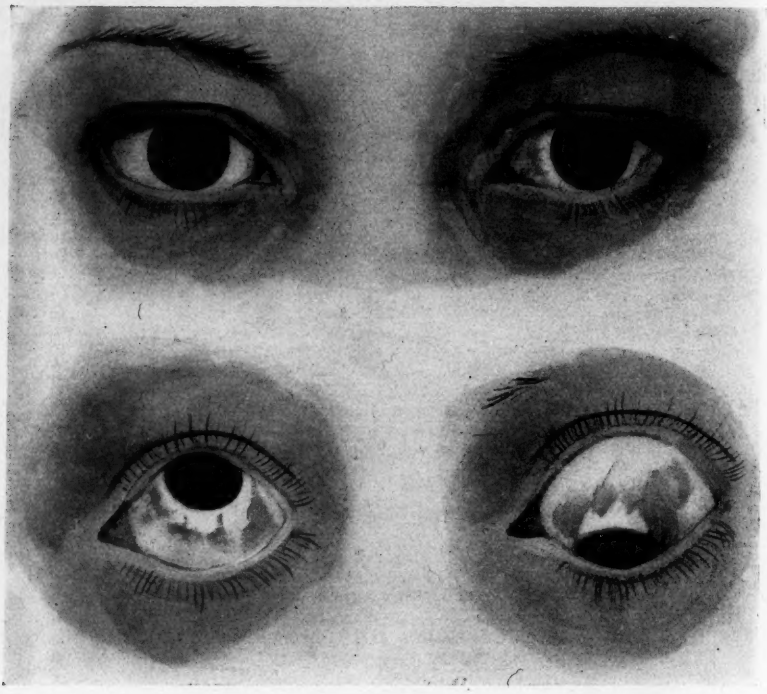
Case 5. June 21, 1921. Margaret G., paperbag maker, aged 25 years, subject of disseminated sclerosis. EXAMINATION OF EYES: *Right eye*: sclerotic in anterior part has two purple areas, one of which forms a zone nearly completely surrounding the cornea with a breadth in most parts of about 4 mm. and reaching the corneal margin at its upper, outer and lower parts. The purple colour is deeper above the cornea and in one portion of the zone is most intense along sclero-corneal margin and at the part furthest from cornea. The sketch suggests a collar round the cornea open at inner side, with an isolated purple area situated above and separated from it by normal sclerotic; iris dark brown; fundus very much darker than that of left eye, no choroidal vessels visible, optic disc normal, refraction, V. = 6/6 nearly fully, not improved by lenses. *Left eye*: sclerotic has no purple patches; iris blue-grey with much yellow in stroma; fundus, choroidal vessels are clearly seen, optic disc obviously too pale, edge very sharply defined, retinal vessels not contracted; V. = 6/12 not fully, has central scotoma for red, both fields show some peripheral contraction, especially left one; Ps. equal, contract to light; lateral nystagmus in lateral positions of eyes. Hair of head, eyebrows and eyelashes very dark brown. She knows of no one with an eye resembling her own right eye. No RE-EXAMINATION. February 17, 1932, her father's sister said that Margaret G. died in 1923, that she was a legitimate child without brothers or sisters, and that her father had blue eyes, her mother's eye colour she did not know.

The sixth case has several violet spots in sclerotic distributed around both corneae. Most of the spots are small and have not altered in appearance from 1919, when she was 17 years of age, to 1932. The iris has the usual surface markings and equal depth of brown in both eyes. A daughter has a dark grey patch in ciliary region of sclerotic.

Case 6. December 5, 1919. Eliza R., aged 17 years, clerkess, complains of difficulty in seeing. EXAMINATION OF EYES: *Right eye and left eye*: sclerotic, in each eye are a number of small and one or two rather large lilac and pale violet areas around the cornea, sketches show seven of these in each eye, none of them extends to sclero-corneal margin; iris rich brown; fundus normal, after H. and C. drops R.V. with −1·50 D. = 6/6, L.V. with −1·25 D. = 6/6. Hair medium shade of brown, complexion blonde. RE-EXAMINED February 17, 1932. She is married and has two daughters. *Right eye and left eye:* sclerotic, no change detected in number or size of the violet spots; iris brown with usual surface markings, no small brown elevations present; Ps., equal, contract to light; eyelashes, eyebrows and hair brown; no moles or naevi in skin. In the right eye of her first born child is a faint dark grey patch in sclerotic situated in ciliary region down-out from corneal margin. Both eyes of this child have epicanthus, and iris is brown. The younger daughter has blue iris.

The seventh case. A carefully executed coloured drawing made by Mr. J. B. Souter at the time of the first examination and since preserved from the light in a closed cabinet is available for comparison at subsequent examinations. In respect of colour, therefore, it is the most reliable case of the series. The sclerotic patches had changed colour when seen in 1932, nearly 22 years after the first examination. They were definitely darker than in 1910, when she was 9 years of age. Also another change had apparently occurred for a small circular violet patch, not shown in the drawing, was situated near the cornea. It is, of course, possible that this had been overlooked and not drawn. In reply to a letter on the subject sent to the artist he says "I should be inclined to say that the spot must be of later development because the drawings were done very carefully under your supervision, and I do not think anything then visible could have escaped your notice." The refraction of the affected eye, at first hypermetropic, became myopic whilst that of of the other eye was hypermetropic and remained so. The affection is unilateral, with iris and fundus more deeply pigmented in the eye with melanosis.

Case 7. May 14, 1910. Rina B., aged 9 years, school-girl. EXAMINATION OF EYES: *Right eye:* eyeball normal, conjunctiva free of pigment; iris dark brown; fundus dark; refraction, V. 6/6 HM. 0·50 D., 1 J. *Left eye*: sclerotic, purple or violet areas in ciliary region, with conspicuous blood vessels in front of them. These areas are nearly homogeneous, but are darkest at part nearest the cornea, with a quite sharply defined anterior margin. The largest area is above and extends to corneal edge, other areas are separated from the corneal margin by 1 to 3 mm. of normal sclerotic, none of the areas extends so far back as to prevent the posterior margin being seen, this fades imperceptibly into normal sclerotic; iris very dark brown, much darker than right iris, no dilated vessels in it; fundus generally shows rather less red than does right fundus, especially noticeable at periphery, and has a slate coloured appearance, optic disc looks very red, retinal vessels normal, refraction, V. 6/6, HM. 0·25 D., 1 J. Corneae of equal size, Ps., equal, contract to light, T.N. Hair dark brown, eyebrows black, eyelashes brown. Skin contains numerous pigmented brown spots, one of 2·5 cm. at right outer canthus. According to the mother, purple areas on left eye have been present since birth. RE-EXAMINED February 3 and 20, 1932. Occupation, clerkess, unmarried. *Right eye:* sclerotic no coloured patches; iris has usual surface markings, fundus very dark, V. with $\frac{+0{\cdot}50\text{ D. sph}}{+0{\cdot}75\text{ D. cyl.}}$ = 6/6. *Left eye:* sclerotic violet coloured areas were compared with a coloured drawing of them made in 1910. They have become darker, more marked in day light than in artificial light; a small circular violet patch situated close to and down-in from cornea does not appear in the drawing, apart from this no new violet areas and no extension of old ones have appeared, blood vessels over the violet areas are now more obvious; iris surface markings as in right iris, no minute brown elevations, fundus very dark, much greyer than in other eye; refraction, V. 6/24 with $\frac{-0{\cdot}50\text{ D. sph.}}{-1\text{ D. cyl.}}$ = 6/6, 1 J.; Ps., equal, contract to



CASE NO. 7.

The upper two drawings are of the right and left eyes. Both lower drawings are of the left eye. The illustrations made from the coloured drawings, fail to show the much lighter colour of the right iris. Some of the characters of the coloured sclerotic areas are shown, but obviously not their violet or purple colour.

light; dark complexion. She is the first born in a sibship of three. The second born, male, has blue eyes, and the third born, male, has brown eyes. Father's iris brown, hair black; mother's iris blue-grey, no "black" blood in father's or mother's relatives, no consanguinity.

The eighth case has bilateral small purple patches. Depth of pigmentation of the brown iris and fundus is the same in both eyes. Brown pigment spots are present in the ocular conjunctiva of the right eye.

Case 8. December 7, 1914. Andrew N., aged 15 years, motor-mechanic. Attended for conjunctivitis. EXAMINATION OF EYES: *Right eye:* sclerotic has a small purple patch a short distance above corneal margin, and another 2 mm. in diameter down-in from corneal margin, two dark brown pigment spots in conjunctiva close to corneal margin below; iris dark brown; fundus dark with much reflection from retina; V. 6/6 nearly fully, no H.M. *Left eye:* sclerotic has pale purple patches, one patch about 8 mm. in length and 2 mm. wide is situated up-in and near corneal margin, two much smaller ones are placed up-out and down-in

respectively: iris dark brown; fundus dark with much reflection from retina; V. 6/6, no HM.; Ps., equal, contract to light; eye movements full; hair very dark nearly black; no moles on skin. NO RE-EXAMINATION: on February 16, 1932, it was ascertained that he was working abroad and had no trouble with his eyes. He is the second born in a sibship of three, all males. His mother previous to marriage had a son and daughter by another man. Parents not consanguineous. Mother's iris blue, father's dark brown.

The ninth case has a unilateral very large purple area above in the anterior part of the sclerotic. The ocular conjunctiva is pigmented and forms a black oval on the upper part of the coloured sclerotic area. There is no difference in depth of pigmentation in the upper and lower parts of the fundus, which is dark in both eyes. The iris of the eye with melanosis is not appreciably darker than the iris of the other eye. Brown pigment spots are present in the skin on several parts of the body.

Case 9. June 23, 1912. Alexander D., aged 14 years, farm servant. EXAMINATION OF EYES: *Right eye:* sclerotic has large single purple area occupying most of its anterior upper part and extending to within 2·5 mm. of corneal margin, posterior to this area sclerotic has normal appearance; an extension of the area upwards and outwards, however, cannot be followed to white sclerotic even when upper lid is completely retracted and patient looks down; pigmented conjunctiva obscures much of upper part of the area and forms a black oval about 2 cm. in length and 5 to 6 mm. in breadth with long axis horizontal, conjunctival vessels seen in front of the pigment; iris, dull greenish brown, not darker than that of other eye; fundus dark, no difference between pigmentation of upper and lower parts: V. 6/6, HM 0·50 D. *Left eye:* sclerotic has no purple patches and conjunctiva is not pigmented; iris dull greenish brown; fundus dark; V. 6/9 not fully, with −0·50 D. cyl. = 6/6. R.P. rather smaller than L.P., both contract to light, eye movements full, no strabismus. He is a strong healthy boy with brown hair, eyebrows and eyelashes, complexion rosy. Skin fair, has a number of isolated brown pigment spots in various parts of the body. He is first born in a sibship of five. The others, two brothers and two sisters, in that order of birth, have no birth marks anywhere. Father and mother also free from naevi and moles. The blackness on upper part of right eye was first noticed by his mother three years ago. NO RE-EXAMINATION, 1932. No trace of him could be found after extensive enquiry.

From the accounts given of the six re-examined cases of melanosis of the eye it is evident that no great change has taken place in any of them. In two of the cases there is definitely no change. In one case, No. 7, the violet patches became distinctly darker and a violet spot seen on second examination was not present in a coloured drawing made at the first examination. In another case, No. 2, the violet coloured area which at first examination had been separated from the cornea by normal white sclerotic was found at the second examination to be touching the cornea. In case No. 1, a purple area nearly reaches the corneal margin which at first examination was at least 2 mm. from it. In case No. 3, a suspected extension of the violet area backwards is much more doubtful. The ages when first examined of the two cases showing definite changes, Nos. 7 and 2, were 9 and 3 years respectively, and the ages of the other four, Nos. 1, 3, 4, and 6, were 7, 20, 17, and 45 years. The intervals of time between the two examinations in the former cases were 21 and 20 years, and in the latter cases, 11, 11, 6, and 12 years. It would be of interest

to know whether greater changes would be found in cases examined in the first three years of life.

The characters of the coloured sclerotic patches in the present series are as follows. Their colour is described as purple, violet, and lilac; slaty-blue would be a good description of some of them. In the majority of cases the patches are limited to one eye. In both bilateral cases Nos. 6 and 8, the coloured areas are small as in three of Selter's bilateral cases, but the area may be large as in the Friedenwalds' case. Bilateral incidence, though unusual, is not rare for Coats mentions cases recorded by Paget, Chaillous and Coover, and cases have been published by Kestenbaum and the Friedenwalds, two cases each by Bourquin and Jablonski, and four cases by Selter. In some eyes of the present series a single patch is present, in others several occur. These are situated in the ciliary region. In some cases, Nos. 1, 6, 8 and 9, normal sclerotic separates them from the cornea, as in cases seen by Talko, Schaumberg, Behr and Bourquin (first case). In other cases, Nos. 2, 3, 4, 5, 7, the coloured areas reach the corneal margin at one or more places and in some they extend along nearly its whole circumference, as in cases reported by Coats, Fleischer and Bourquin (third case). The size of the coloured areas is very variable. Some occupy a large part of the sclerotic, others are small and in some cases measure only 1 or 2 mm. The posterior limit of a patch is usually readily seen though it tends to become faint as it merges into normal sclerotic and contrasts with the better defined anterior margin as in cases Nos. 1 and 7. In case No. 5, however, the posterior margin of the coloured area in places is as well defined as the anterior margin. In all cases with one exception the whole extent of each coloured area is visible. In case No. 9 the coloured area extends in one direction so far backwards that normal sclerotic cannot be seen beyond it. In this connection it may be noted that in excised eyes pigmented areas have been found at the posterior part of the sclerotic. Talko (1869) found in both eyes of a case of meningitis whitish slate-grey pigment spots confined to the posterior part of the sclerotic from equator to optic nerve. The black colouring of the sclerotic was not due to thinning but to pigmentation of its most superficial layers. Hulke (1860) found in an excised eye, with melanotic cancer of choroid, the sclerotic mottled with purple spots that were numerous in the ciliary region and around the posterior pole. Reese (1925) examined microscopically an eye with melanosis oculi which had pigment spots over the entire scleral surface and contained a melanotic sarcoma of choroid. Doherty (1927) examined a glaucomatous negro eye with melanosis oculi. Macroscopically the excised eye in its anterior third presented a diffuse collar of pigment, the posterior third showed isolated black blotches.

In some cases in this series besides abnormal sclerotic appearances other conditions were present of sufficient interest to mention. The iris in case No. 3 had a light colour which must be very unusual, for Bourquin found that not one of more than 60 cases of melanosis bulbi had a light coloured iris—blue, green, grey—in association with sclerotic spots. A comparison of Streiff's case with this one is of interest. In his case the iris was pale olive green at nasal part and dark brown at temporal part. Faint violet-grey spots were present in the sclerotic only in the region adjoining the brown part of the iris. In the present case both irides were pale, and though the upper part of the iris in the affected eye was a shade darker than the rest of the iris the coloured sclerotic area almost completely surrounded the cornea. Another interesting condition is seen in case No. 2, in which the numerous minute brown elevations that cover the surface of the left iris are comparable with those described by Coats and Treacher Collins in 1912. Since their cases were published a number of others showing similar appearances have been reported by Langdon, Kuboki, Streiff, the Friedenwalds, Fleischer, Gjessing, Bourquin, and Larsen.

Associated pigmentary conditions of the conjunctiva and of the skin are not uncommon in melanosis bulbi. The former occurs markedly in case No. 9, in which a large black oval appears in the ocular conjunctiva, and in a minor degree in case No. 8. Pigmented spots were present in the skin in cases Nos. 1, 7 and 9. There was no evidence of disease in any of the eyes with melanosis excepting in case No. 5 with disseminated sclerosis.

The refraction of the eye with melanosis, according to Bourquin, presents nothing special. In the present series, four of the eleven eyes with melanosis have a low degree of myopia. The remaining seven eyes are hypermetropic or emmetropic. In case No. 7 the refraction of the eye with melanosis changed from hypermetropia to myopia whilst in the other eye there was no such change. Jablonski in a case of congenital melanosis of the sclerotic found the more melanotic eye by far the more myopic. On the other hand a case of Fleischer's was emmetropic in the pigmented eye and myopic in the other.

Few hereditary cases have been recorded. Jablonski saw blue-black discoloration of both sclerotics in two sisters. In Bourquin's first case, a male, aged 44 years, the son and father were also affected, melanosis bulbi thus appearing in three consecutive generations. Selter recorded sclerotic patches in two generations, a father, his daughter and two sons. The sons were twins, aged three years. In case No. 6 of the present series a mother with melanosis of both eyes has a daughter with a dark grey patch in the ciliary region of one eye. In none of the other families is there any suggestion of inheritance of sclerotic patches. The information,

however, is limited to statements received from patients and their parents. In none of the sibships is there more than one individual with coloured areas in the sclerotic. The order of birth of the affected individuals is known in six cases. Case No. 1 is fifth in a sibship of six, case No. 2 is sixth in a sibship of six, cases Nos. 3 and 7 first in sibships of three, case No. 8 second in a sibship of three, and case No. 9 is the first of five. In five instances the colour of the iris of both parents is known and in four of these the iris of one parent is blue and of the other brown, in the fifth instance the iris is grey in one parent and brown in the other.

In conclusion, of the six cases with coloured areas in the sclerotic which have been re-examined after a period of years it can be confidently stated that the appearances have not changed in two cases, but that definite changes have occurred in other two cases, in one as regards colour, in the other as regards increase of area. In the remaining two cases the evidence is not sufficient to warrant any statement that there has, or has not, been any change. The results suggest that further observations are needed and that measurements are necessary on first examination in order to detect subsequent minor changes. Information is particularly required regarding what occurs during the first two or three years of life.

REFERENCES

1. **Behr.**—*Diss.*, Heidelberg, 1903. Quoted by Bourquin.
2. **Bourquin, Jean.**—*Zeitsch. f. Augenheilk.*, Vol. XXXVII, p. 155, 1917.
3. **Cerise** and **Chéné.**—*Société d'ophtalmologie de Paris*, Déc. 5, 1911; *Ann. d'Ocul.*, Vol. CXLVI, p. 432.
4. **Chaillous.**—Quoted by Terson.
5. **Coats, George.**—*Trans. Ophthal. Soc. U.K.*, Vol. XXXII, p. 165, 1912.
6. **Collins, E. Treacher.**—*Trans. Ophthal. Soc. U.K.*, Vol. XXXII, p. 171, 1912.
7. **Coover, D. H.**—*Ophthal. Rec.*, Vol. XIX, p. 153, 1910.
8. **Davis, A. Ed.**—*Trans. Amer. Ophthal. Soc.*, Vol. XXV, p. 89, 1927.
9. **Doherty, W. B.**—*Amer. Jl. of Ophthal.*, Vol. I, 1927.
10. **Fleischer, Bruno.**—*Klin. Monatsbl. f. Augenheilk.*, Part II, p. 170, 1913.
11. **Friedenwald, H.,** and **Jonas, S.**—*Arch. of Ophthal.*, Vol. LIV, p. 51, 1925.
12. **Gjessing, H.**—*Norsk Mag. for Laegevid.*, Vol. LXXV, p. 793, 1914.
13. **Hildesheimer.**—*Klin. Monatsbl. f. Augenheilk.*, Part I, p. 548, 1920.
14. **Hulke, J. W.**—*Roy. Lond. Ophthal. Hosp. Repts.*, Vol. III, p. 280 1860.
15. **Jablonski.**—*Berliner Ophthalmologische Gesellschaft*, February, p. 26, 1920; *Klin. Monatsbl. f. Augenheilk.*, Part I, p. 548, 1920; and *Deuts. med. Wochenschr.*, Vol. XLVI, p. 644, 1920.
16. **Kestenbaum, Alfred.**—*Zeitsch. f. Augenheilk.*, Vol. XXXIV, p. 317, 1915.
17. **Kuboki.**—Nippon Gankakai Zashi, December, 1913, Ref. *Klin. Monatsbl. f. Augenheilk.*, Part I, p. 570, 1914.
18. **Langdon, H. Maxwell.**—*Arch. of Ophthal.*, p. 148, 1932.
19. **Larsen, V.**—*Verh. Ophthal. Ges.*, pp. 18-21, 1929; *Hosp. tid.*, Part I, 1930. Ref. *Zentralbl. f. Ophthal.*, Vol. XXIV, p. 511, 1931.
20. **Liebreich, R.**—Atlas of Ophthalmosc. Second Edit., p. 28, 1863.
21. **Paget, Stephen.**—*Brit. Med. Jl.*, Part I, p. 120, 1887.
22. **Reese, A. B.**—*Amer. Jl. of Ophthal.*, p. 864, 1925.
23. **Shaumberg.**—*Diss.*, Marburg. 1882. Quoted by Bourquin.
24. **Selter, E. M.**—*Monatsschr. f. Kinderheilk.*, Vol. XXXI, p. 587, 1926.
25. **Streiff, J.**—*Klin. Monatsbl. f. Augenheilk.*, Vol. LIV, Part I, p. 33, 1915.
26. **Talko, Jos.**—*Klin. Monatsbl. f. Augenheilk.*, p. 204, 1869.
27. **Terson, M. A.**—*Ann. d'Ocul.*, Vol., CXXXI, p. 127, 1904.

MEMORANDUM

Regarding a Family in which Neuro-Retinal Disease of an unusual kind occurred only in the Males

BY

ERNEST THOMSON

STIRLING

I HAVE called this a Memorandum for several reasons. The actual case histories are imperfect, while the ancestry beyond the parents is unobtainable. All that can be said is that the parents have no knowledge of serious defect in their forbears. I may add by way of excuse for imperfections that all the children were seen in the course of a routine school ophthalmic clinic where time and opportunity for investigation and consultation with colleagues are limited.

There are two outstanding facts. (1) The mother has eight living children and had two mishaps. All the surviving children were born in abnormal presentations and in each case there was rather severe post-partum haemorrhage. Of the eight living children four are boys and four are girls. Of these the four boys are affected. The four girls are definitely reported to be normal sighted. The only girl examined by me was normal except for low myopia. Had any of the other three girls suffered from defective vision they would, in the ordinary course, have been referred to me by the School Medical Officer. Indeed the mother would have brought them of her own accord, had she observed any defect. She was so positive, however, that they were perfectly normal that she seemed unwilling to have them examined, and the point was not pressed.

(2) The second principal fact is that the four boys all had a peculiar macular condition with varying degrees of affection of the optic nerve, while, in one case (Thomas), chronic retinal disease eventually led to retinal detachment in both eyes and to a cicatrix in or near one macula. In this case the unfortunate position has been reached that while the patient is unfitted for anything except very simple employment he has been refused certification as a blind person "within the meaning of the Act."

The three oldest boys have been under observation, more or less, since 1920 when they were seen consecutively. The fourth came to notice rather later (in 1926) and is probably the most typical as regards the macular appearances. In two of the boys (Thomas being one of them) Dr. Forgan, County V. D. Officer, reported a negative Wassermann reaction. One of the boys (Thomas) is reported to have had "fits" in infancy. Nothing else has been discovered of any importance, but complete scientific investigations have not been possible.

An interesting point is the position of the boys and girls in the family mixture. The following table shows the positions and the ages in 1931.

Annie	25	years approximately	Married
John	23	„ „	Labourer
James	20	„ „	Labourer
Thomas	17½	„ „	Training School for the Blind
Peggy	15	„ „	At home
Donald	12	„ „	At a Special School
Janet	10	„ „	At School
Bessie	8	„ „	At School

One might be inclined to think that the sequence John, James, Thomas, is significant, but Thomas is followed by an unaffected girl who, in turn, is succeeded by an affected boy and he by two unaffected girls. Further, the eldest child is a female.

With regard to the parents themselves. The father is a worker on the railway and is reported to have the good vision required of such workers. The mother is a healthy looking woman who admits no defect in herself. As to the possibility of a luetic background it can hardly be said that two "mishaps" out of ten pregnancies point in any particular direction, while the negative Wassermann reaction in two of the cases and the absence of any clinical evidence of inherited lues are against such disease as a root cause of a trouble in exactly one half of the surviving children all of the same sex.

I do not propose to offer any disquisition as to the category in which these cases are to be placed. They do not seem to fit in with anything which I have seen before. John, James and Thomas were shown at a meeting of the Scottish Ophthalmological Club some years ago. So far as I recollect the discussion did not reveal any definite opinions.

The details of the visual defect and the fundus appearances so far as available will be found in the abbreviated case histories appended. These histories are, as previously stated, incomplete, but, taken as a whole they indicate a sex-limited neuro-retinal disease with a tendency, as shown in the case of Thomas, to the formation of scar tissue in the retina, with resultant detachment. There is no question of mental defect in any of these cases.

The ultimate prognosis is poor, possibly even bad, since in three out of the four cases the vision is insufficient for a man's full work, while the fourth case, Donald, is still only 12 years of age and

is being educated in a special school where his visual defect is allowed for. The fundus drawings show (2) the typical macular condition in Donald (right eye), a condition which was seen in greater or less degree in all these boys in one eye or the other, and (1) the subsequent gross change which occurred in the case of Thomas (right eye).

The Case Histories

These must be somewhat abbreviated but include the essential facts:

JOHN. First seen June 9, 1920. Aged 11 years. V.A.R. 6/36. L. 6/36.

R. + 0·50 D. sph. + 0·75 D. cyl. 180° 6/36 } Binoc. 6/18.
L. + 0·50 D. cyl. 180° 6/24 }

O.E.R. temporal segment of disc pale. Fundus seems otherwise normal. L. disc pale. Greyish exudate (?) under the retinal vessels at upper inner part of disc. Macula presents radiating streaks, nature obscure. (This being the first case seen.)

1921. Vision I.S.Q. Conditions similar.

1931. Reported working as a labourer, stoking a furnace. Not able for any better job owing to bad vision.

JAMES. First seen June 9, 1920. Aged 8 years. V.A.R. 6/18. L. 6/36.

R. + 2·50 D. sph. + 0·50 D. cyl. 180° 6/12 attempts.
L. + 3·50 D. sph. + 0.50 D. cyl. 180° 6/36.

O.E.R. The macula of this eye presents the same radiating appearance as in the case of John's left eye. Up and in at the disc margin "there is an area rather like a later stage of the exudate mentioned in the case of John." Temporal pallor of disc. L.E. "The only thing to be said is that the disc looks a little solid and flat."

1921. The V.A. was recorded as 6/18 and 6/24 but the notes do not state whether with or without correction.

1930. Now aged 20 years. V.R. 6/24, L. 6/60 (not improved). Works as a labourer in a garage. Is periodically out of a job owing to defective vision, especially at night. O.E. Both discs pale. Details of macula could not be made out without atropine, the use of which was inadvisable in the circumstances.

NOTE.—The absence from the school clinic of these two older boys for the years between 1921 and 1931 is unfortunate. It was probably due to want of appreciation of the gravity of the defect by the parents when the boys were at school. Later, when it was found difficult to get work, every effort was made to keep the two younger boys under observation.

THOMAS. First seen June 9, 1920. Aged 5½ years. Convergent squint of R.E. with jerky type of nystagmus.

V.R. Amblyopic. L. 6/24.
R. Refraction not worked.
L. + 1·25 D. cyl. 90° 6/24.

O.E.R. Not easy to examine owing to squint and nystagmus. "There appears to have been a neuro-retinitis leaving optic atrophy and cicatricial tissue along some of the vessels. L. disc pale and irregular in outline. Spots of pigmentary change in various parts of fundus and a suggestion of the same macular appearance as in the two brothers." History of fits in infancy.

1921. The binocular vision was 6/18 some letters, while in 1924 it was 6/36. At this time the right disc is stated to be atrophic and the left disc pale.

1925. Binocular vision was 6/24.

1927. In December of this year a number of serious changes had occurred since *1925.* "*In the right macular region* there is a curved area (described as of apparent size of upright image three quarters of an inch, though this is an exaggerated estimate) of choroido-retinal atrophy which in appearance strangely resembles an early embryo, concavity downwards. *White lines along vessels: in lower part of* fundus a localised retinal detachment. In the left eye a strand of tissue passes *from an inferior* vessel near the disc to what appears to be a detachment farther forward."

1928. In the early part of this year the boy came under the care of Dr. Somerville Martyn at *the Glasgow Eye Infirmary who reported:* "Optic Neuritis: detachment of retina."

1929 Condition much as before.

1931. In December of this year, the patient being now aged *18 years and an* inmate of the Royal Blind School, Craigmillar Park, Edinburgh, it was ascertained *that V.A.R. was 1·5/60 and* V.A.L. *6/24* and about J. 6 held rather close. The curved area in the right fundus was now a definite, slightly pigmented cicatrix, while one of the inferior temporal vessels was involved in a ridge-like detachment downwards and outwards. *There is no reliable note regarding the left eye at* this time.

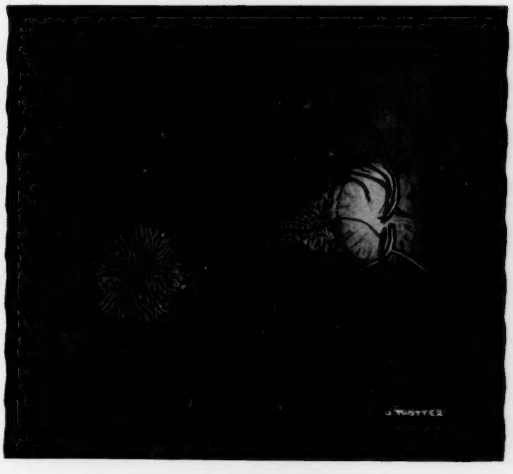
In April, 1932, a drawing of the right fundus was made by Mr. John Trotter, Jr., Glasgow (Fig. 1). It shows the post-neuritic appearance, the cicatrix in (or near) the macula, and the posterior part of the ridge-like detachment in which two vessels are involved. What it does not show, and the drawing is wonderfully correct, is that definite atrophy which previous notes of this and the other cases would lead one to expect. My earlier notes may have been wrong or the appearance may have altered. Certainly the earlier observations were made with a reflecting, the later with an electric ophthalmoscope. The point must remain in doubt. The cicatrix looks, in the actual fundus and in the drawing, as if lower than the macula but no macula could be seen other than the region of the cicatrix. At the time the drawing of the right fundus was made it was still possible to detect in the left fundus the macular streaking. The strand of tissue passing from the disc region to a retinal detachment of the same type as that in the right eye still persisted.

Quite recently Thomas was examined under the Blind Persons (Scotland) Act, 1920, at the Regional Clinic in Glasgow, and was considered not to be a Blind Person within the meaning of the Act.

DONALD. First seen March 18, 1926. Aged 6 years. V.A.R. 6/18 partly. *L. 6/60. R. + 3·0 D. sph. 6/18.* L. amblyopic. Retinoscopy same as R.E. Convergent squint.

In the case of this fourth member of the family there is no determinable change in the conditions since he was first seen. The condition today will therefore be sufficient. The right fundus is at first glance fairly normal-looking though the disc is somewhat pale. Closer examination reveals more clearly than in any of the other brothers the radial streaks at the macula. The macular area looks larger than normal, because of the striae; these start from

FIG. 1 (THOMAS).



UNIV. OF MICH.

FIG. 2 (DONALD).

(For method of viewing this drawing, see the text).

a circular foveal area around which are a few dots of the same colour as the streaks. The latter can be traced over an area nearly equal to that of the disc, look faintly yellow or yellow-grey, and suggest a definite tissue. On the other hand, there is a conical area with its base at the temporal side of the disc and its apex towards the macula which is clearly made up of small dots and masses of quite irregular shape but having a similar tint to that of the macular striae. It seems possible that these striae are really made up of fine dots, athough the ophthalmoscope failed to determine it. It is to be noted that a few dots are arranged in a ring round the fovea. Mr. Trotter's drawing (Fig. 2) gives a good representation of the appearances provided it be looked at in artificial light and held slightly out of focus, too near or too far for perfect definition. In daylight, and held at ordinary reading distance, the radiating streaks are somewhat too obvious. In actual fact, exact focusing is required to resolve them into a definite picture when using the ophthalmoscope; they can very readily be missed, though unmistakable when found.

The left fundus presents, and always has presented, a malformed, small and definitely atrophic disc and small retinal vessels (the latter not a noticeable feature of these cases as a group). Glistening dots and slight pigment disturbances are scattered in various parts of the fundus. No radial striation has been detected by me in the macular region of this eye, although the members of the Board at the Regional Clinic in Glasgow who examined both James and Donald reported, as regards Donald, "both maculae showed slight radial lines of pigment irregularity." Incidentally, they recognized the probable familial nature of the cases although the family history was not, I believe, before them. My own personal impression of the changes, however, is that they consist not so much of "pigment irregularity" as of a definite tissue alteration.

Quite recently Donald, who is now aged about 12 years, was found to have R. V. 6/12 attempts and L. V. 1/60. This V. A. 6/12 is probably the best found in any of the four boys. In view of the histories of his brothers Donald has been educated in a myope class and carefully supervised.

Visual Fields

The fields in the cases of Thomas and Donald were taken recently, using an ordinary perimeter and not with any great accuracy.

Thomas. Left Eye. The field for white, using a 5 mm. object was restricted above and nasally to 15 degrees. There was also a certain amount of restriction down and out, although in the circumstances too much reliance cannot be placed on the response. A more certain finding was a definite central scotoma for red, green

and blue up to about a 2 mm. object size. Yellow was doubtful but a 1 mm. white object was seen.

Donald. Allowing for a deep-set eye the peripheral field of the right eye is full but, as in the case of Thomas, there is a definite central colour scotoma; in this case, however, only red and green fail below a 2 mm. object size. Yellow, blue and white are all seen at a very small angle.

Naturally, neither the R. E. of Thomas nor the L. E. of Donald could be expected to give a field record.

Summary

To sum up, we have here four males in a family of four boys and four girls, the males with exceptionally poor vision, the females apparently unaffected. In the four males the R. V. A. is respectively 6/36, 6/18, less than 6/60, 6/12 attempts; the L.V.A. 6/36, 6/24, 6/24, 1/60. The best binocular corrected V. A. 6/18, 6/18, 6/24, 6/12 (?). In all four there was an unusual macular condition in at least one eye.

The two oldest have passed out of observation but are known to be bad sighted and to find it difficult to do labouring work, if indeed they find any employment. Of the two youngest, one has suffered from neuro-retinal disease and retinal detachment; he is out of employment. The other has one amblyopic eye and one eye (possibly, indeed, both eyes), affected with the macular disease, if it is to be so designated. This, meantime, appears to be stationary.

A CASE OF RETINAL GLIOMA TREATED BY THE INSERTION OF RADIUM NEEDLES IN THE ORBIT

BY

V. McDOWALL

HON. RADIOLOGIST AND RADIUM THERAPEUTIST, BRISBANE HOSPITAL

AND

E. O. MARKS

HON. OPHTHALMOLOGIST, HOSPITAL FOR SICK CHILDREN, BRISBANE

THE treatment of intra-ocular growths by radium has been the subject of communications by R. Foster Moore and others in recent numbers of this Journal. The possibility of treatment by this means as an alternative to excision, particularly where excision would entail total blindness, is a question the importance of which

needs no emphasis, and our sincere thanks are due to those workers for the publication of their results.

The following notes of a case of retinal glioma are submitted, not merely because of the entirely satisfactory results to date, seven months after the application of radium, but because the method adopted seems simpler, easier, and in ordinary hands safer than that used by Foster Moore, which was the insertion of radon seeds actually within the intra-ocular growth.

Fortunately retinal gliomata are not common. This is the only case seen at the Brisbane Hospital for Sick Children for some years, and we may reasonably hope that a similar time will elapse before another occurs. We would have preferred waiting longer before publishing this result in order to make more certain of the permanence or otherwise of the cure, but the exceedingly satisfactory result to date renders it desirable to draw attention to this different method of application while interest is centred on the subject, so that it may be considered by those who have a large number of cases to deal with. We wish to make it clear that while there now seems quite a hope that the result is permanent, it is far too early to be confident.

From an ophthalmological aspect the case has been entirely in the hands of one of us (E. O. M.) and the radium treatment entirely in the hands of the other (V. McD.), both as to dosage and the application thereof. The method and site were the result of consultation between us.

On June 1, 1931, A. H., male, aged 6 months, was referred to the Hospital for Sick Children by Dr. T. H. Mansfield, with the diagnosis of bilateral glioma. The parents had noticed something behind the pupil of the left eye for about three months previously. A few days before admission the eye had become inflamed. No abnormality had been noticed by the parents in the right eye.

On admission the left eye was in a condition of acute glaucoma, the state of the cornea rendering impossible any intra-ocular view. There was no question as to the necessity of removing the left eye, quite apart from whether it was suffering from malignant disease or not.

Pathological examination of the left eye by Dr. J. V. Duhig gave the following report:—

"Retinal glioma. The whole vitreous body is replaced by a degenerating mass of tumour cells in typical rosette formation. Section through the optic nerve shows no infiltration."

To outward view the right eye appeared normal but ophthalmoscopic examination when under the anaesthetic for enucleation of the left eye revealed a white globular mass, traversed by vessels, situated in the upper temporal quadrant. The summit of the mass was visible with a plus 12 dioptre lens, the normal fundus with plus 1.

The protrusion forwards of the tumour was thus represented by about 11 dioptres. The diameter of the tumour was about two-thirds of the distance between the macula and the anterior limit of vision with the atropinised pupil. The tumour just missed the macular area and was situated well away from the optic disc. The remainder of the fundus appeared normal.

While the eye itself was still capable of useful vision if the tumour could be cured, the distance of the tumour from the optic nerve rendering unlikely an immediate extension of the tumour outside the eyeball, it was felt that radium treatment should be tried before advising the ghastly alternative of removing the only eye. This opinion was fully shared by Dr. J. Lockhart Gibson, Honorary Consulting Ophthalmologist to the Hospital. The child was accordingly transferred to the radium clinic at the Brisbane General Hospital.

In view of the fact that an infantile eye is less than two centimetres in diameter, the apex of the tumour being less than one centimetre from the sclerotic, it seemed preferable to apply the radium from the orbit in as close apposition to the base and growing margin of the tumour as possible, rather than run the risk of injuring or infecting the interior of the eye by penetrating it. A further advantage was that the maximum radiation would be in the vicinity of the base of the tumour and not in the vicinity of the centre, with a less likelihood of necrosis in consequence.

Previous experience in radium treatment of a basal celled carcinoma of the bulbar conjunctiva had shown that there was little danger of injury to the sclerotic by the radium.

On June 12, three 0·5 mg. needles of 0·5 cm. active length with a filtration in 0·5 mm. of platinum were inserted through small incisions in the upper lid over the area nearest the base of the tumour, and spaced one centimetre apart. The needles were removed after six days, a total dosage of 216 milligramme hours.

There was a slight reddening of the skin in the vicinity of the incisions, but no inflammatory reaction showed in the eyeball, the eye being kept atropinised. The wounds in the lid healed up readily, and no thickening has resulted, the lid now appearing normal. No reactionary erythema appeared in the lids at any time.

The ophthalmoscopic changes in the tumour have been striking. On June 20, two days after removal of the needles, the child was feverish with some disturbance of the bowels, so that the pyrexia may not have been due to the radium.

On June 22, the child was still sick and appeared to be in pain but the eye was quite free from inflammation. The tumour seemed smaller and the swelling reduced to about 7 dioptres, but the examination was very difficult.

On June 29, a great change was noticeable, the mass being no longer spherical, but irregular, shrunken, and crenated, the summit being visible with a plus 4·0 D. lens.

On July 6, the summit required a plus 2·0 D. lens but no mydriatic had been instilled, and on July 13 a plus 3·0 D. lens was required.

On July 20, the summit was seen with a plus 1·0 D. lens, there being no appreciable raising above the rest of the fundus. The former tumour had now become (and has since remained) an irregular patchy white area with vessels running across it. The remainder of the fundus and the media appear quite normal. At one time there was a slight opacity on the cornea.

Though there was no sign of recurrence it was considered desirable for safety, the original dose having been rather small, to give a further application of radium. From August 7 to 9 radium treatment was applied, through a Columbia paste mould 2·0 cm. in thickness, to the upper part of the orbit and right temporal regions by means of four 4·0 mg. needles each of 2·0 cm. active length and filtered with 0·5 mm. platinum. A total dosage of 960 milligramme hours.

No inflammatory reaction resulted, and the intra-ocular condition remains now, January 12, 1932, as it was at the end of July. So far as can be judged the child sees well. It is the picture of good health.

The initial dose of radium was on the low side because the age of the patient was such that ordinary dosage might produce damage to healthy structures. The response of the tumour showed that it was radio-sensitive. As there appeared no sign of recurrence at the time of the distance treatment, this was also kept within safe limits. The insertion of the radium needles would have been easier if the needles had been curved instead of straight, and by enabling the needles to lie in closer contact with the eye would have ensured a more uniform radiation.

While checking the proofs of the above, the opportunity is taken to bring the information up-to-date, practically one year from the initial application of radium. The eye was again examined under a mydriatic and general anaesthesia on May 27, 1932. Doctors J. and W. Lockhart Gibson and T. H. Mansfield kindly confirmed the absence of any sign of recurrence of the tumour. The condition is now as described for July 20, 1931.

THE GULLSTRAND GOLD MEDAL OF THE SWEDISH MEDICAL SOCIETY

THIS medal was instituted in honour of the late Professor Gullstrand in 1922. There has been no award since that date. It is with the greatest pleasure we announce that this medal has now been awarded to Professor Priestley Smith for his "Ophthalmological researches, especially regarding glaucoma and the permanent growth of the lens." Few ophthalmologists of his generation in the world, and none in Britain, have done more brilliant work than Professor Priestley Smith. The Gullstrand Gold Medal is an honour primarily to the recipient and through him to British Ophthalmology and we are sure that all in this country and indeed all over the world will wish to associate themselves with us in congratulating the veteran Priestley Smith upon this recognition of his life's work.

ABSTRACTS

I.—PATHOLOGY

(1) **Chapman, Vernon A. (Milwaukee, Wisconsin).—A case of melanoma of the caruncle.** *Amer. Jl. of Cancer*, Vol. XVI, No. 3, May, 1932.

(1) **Chapman** records a case which occurred in a farmer, aged 58 years, who was seen in November, 1924. Four years before a small black spot had arisen at the inner corner of the left eye. It increased in size, gradually at first, and more rapidly during the last year. No history of injury was obtained. The illustration shows a triangular intensely black, lobulated tumour of the caruncle extending downwards and outwards between the globe and the lower lid; it was not attached to the sclera. The lid margins in apposition showed early infiltration with brown pigment. Under general anaesthesia the growth was removed by block dissection, with the inner third of each eyelid, the skin of the nose on that side and the fat from the inner quadrant of the orbit. Ten glass radon seeds of 0·5 millicurie each were implanted in the tissue about the site of the tumour. The patient made an uninterrupted recovery and when seen, in August, 1931, there was no sign of recurrence.

The pathological report was "spindle-celled melanoma of the eye."

Four excellent microphotographs illustrate the histology of the growth. The author comments on the comparative benignity of the tumour in this instance.

R. R. J.

(2) **Baquis (Florence).—Further contribution to the study of tumours of the reticulo-endothelial system; reticuloma of the orbit. (Ulteriore contributo allo studio del tumori del sistema reticolo endoteliale; reticuloma del orbita).** *Lett. Oftal.*, April, 1932.

(2) **Baquis** gives the history of a case of orbital tumour which he was able to follow from an early stage to the end. The subject was a boy, aged 10 years; a swelling had been noticed in the right upper lid for some three weeks. The growth increased very rapidly. After application of radium, the mass disappeared but recurred after a short interval. Further application of radium again caused shrinking of the mass, of which a part had been excised and examined, proving to be a round celled sarcoma; the parents would not permit at this time any surgical interference, but after further relapse the orbit was emptied. At the operation the whole orbit was found to be filled by new growth, which was not in any place adherent to the bone. Further relapse occurred and the boy died with cerebral complications, 18 months after the first appearance. Baquis discusses the nature of the growth and decides that it was a primary sarcoma of the reticulo-endothelial system, and probably of the same nature as "Ewing's sarcoma." This has never previously been met with in this situation.

The points in favour of this, are the reaction to radium, the absence of metastases, the soft consistency and slight fever, which led the family doctor to mistake the last recurrence for an abscess and to incise it.

HAROLD GRIMSDALE.

(3) **MacMillan, J. A. (Montreal).—On the origin and disposition of the cells in endophthalmitis.** *Trans. Amer. Ophthal. Soc.*, Vol. XXIX, p. 444, 1931.

(3) **MacMillan** has made slit-lamp investigations and a histological study of 70 cases of endophthalmitis, with the object of demonstrating the distinctive linear arrangement of the cells in this disease. This phenomenon is not seen in severe or long standing cases.

Large deposits of leucocytes are to be seen on the orbiculus ciliaris just in front of the ora serrata for a distance of 1-2 mm. and from this they take two main paths, one into the interior of the vitreous in the direction of its centre and the other backwards along the retina with offshoots into the vitreous.

Another mass of cells is situated 1 mm. in front of the one described above; and from this lines of cellular extension pass over the zonula and posterior aspect of the lens to be continuous with the same linear extension on the opposite side.

In the posterior part of the globe the cells lying free in the vitreous are disposed in irregular and ill-defined banks and some are heaped up on the retina in the vicinity of a blood vessel. It is probable that the cells migrate along the vitreous fibres. MacMillan quotes Salzmann's account of the structure of the vitreous and points out the similarity between the linear arrangement of cells in endophthalmitis and the disposition of the fibre structure of the vitreous. He suggests that the vitreous fibres guide the cells after their escape into the vitreous.

MacMillan stresses the importance of the anterior border layer of the vitreous in delimiting cellular migration and influencing the clinical picture in endophthalmitis and iridocyclitis.

The cells are mainly polymorphonuclear leucocytes and come from that portion of the ciliary body to which the base of the vitreous is attached and from the retinal vessels. The cells which invade the anterior segment of the eye come from the anterior portion of the orbiculus ciliaris, corona ciliaris and iris. In severe infections involving both the anterior and posterior segments the iris, ciliary body and retina supply the cells.

H. B. STALLARD.

(4) **Samuels, Bernard (New York).—Some notes on orbital tumours.** *Arch. of Ophthal.*, June, 1932.

(4) Much has been written about the morphology of orbital tumours and Samuels in this paper, concerns himself more with the manner in which the pre-existing orbital structures react to the presence of a neoplasm. Carcinoma cells in their metabolism produce an intensely irritating toxin which brings about lymphocytic infiltration of the adjoining tissues with the result that bands of connective tissue are formed which impede the growth of the tumour. These bands, by their contraction, may draw the eyeball to one side and fix it to the wall of the orbit. Cylindromas usually derived from the lacrymal gland and resembling basal celled carcinoma are not so irritating, though there may be a good deal of fibrosis associated with them, also glaucoma may occur in these cases, as a result of interference with venous outflow. Sarcoma, in contrast to carcinoma, produces few signs of inflammation in the surrounding tissue. Though definitely malignant, this tumour often appears to have a capsule. The growth may indent the sclera without perforating it and so may bring about an intra-ocular appearance simulating retinal detachment. Haemangiomata are rare in the orbit but dangerous because of their

tendency to enlarge and to cause pressure atrophy of the orbital contents and even of the bony wall. Neurofibromatosis, especially in the apex of the orbit may bring about early reduction of vision by pressure on the optic nerve. A contrast is afforded by glioma of the optic nerve in which vision may be preserved for an indefinite time. The absence of pain in most neoplasms of the orbit, is probably due to the easy displacement forward of the eye. Intra-ocular sarcoma provides a contrast to carcinoma in that the irritation it produces is due to a toxin developed as a result of necrosis of its constituent cells, whereas, in carcinoma, the toxin is produced by the living cells. Purulent necrosis of the sclera may occur beneath a choroidal sarcoma and allow of its extension to the orbit. Samuels' article concludes with a short account of the difficulties in diagnosis of inflammatory pseudo-tumour of the orbit and a warning against exenteration being performed without excluding a syphilitic or other inflammatory cause for the proptosis.

F. A. W-N.

II.—LENS

(1) **Kirby, Daniel B. (New York).—Calcium in relation to cataract.** *Arch. of Ophthal.*, June, 1931.

(1) Kirby's examination of the literature on this subject reveals the following :—

1. That calcium decreases the permeability of the lens capsule which normally acts as an inert semi-permeable membrane. A slight reduction in the permeability of the lens capsule will obstruct the metabolic processes of the lens sufficiently to cause cataract. 2. That solutions of calcium salts have no action on fresh animal lenses *in vitro* except in concentration far beyond the physiological range. 3. Lenses unaffected by ultra-violet light can be rendered opaque by this means if previously sensitised with calcium chloride in a concentration which by itself is too weak to cause any changes. 4. The excess of calcium found in cataractous lenses is a secondary phenomenon and is not the primary cause of senile cataract. 5. The primary change is probably breaking down of the complicated colloidal solution of lens protein with extrusion of a molecule of water. 6. Calcium is of importance in stabilising any colloidal solution.

With these considerations in mind Kirby investigated the effect of varying concentrations of calcium on the growth of lens epithelial cells *in vitro*. Six separate cultures were used in each experiment of which three were controls. These experiments

showed that the cells would withstand relatively large increase in the calcium content of the culture medium but that slight reduction below the optimum amount produced toxic reactions. It is known from the experiments of Burge and others that a cataractous lens contains 12 times as much calcium and about a quarter as much potassium as does the normal one. The next question to decide therefore was the effect of altering the calcium and potassium content of the culture medium in which the lens epithelial cells were being grown. Increase of the potassium content produced no effect, and although that of an absolute decrease in potassium content is not reported, a relative decrease, *i.e.*, by increasing the calcium content produced no harmful effect either.

With regard to cataract *in vivo*, there seems to be an undoubted relationship between calcium deficiency and parathyroid cataract, but in senile cataract there is no evidence of any such relationship. In the first place the serum of patients with cataract contained the normal or possibly a little more than the normal amount of calcium and secondly, elaborate dietetic experiments (giving acid and alkaline diets and measuring the total intake and excretion of calcium) showed that patients with cataract responded normally to the factors influencing calcium metabolism and were utilising the element in the proper manner. The author can therefore see no indication for the administration of parathyroid to patients suffering from senile cataract.

F. A. W-N.

(2) **Evans, Everette I. and Keen, Ruth (Chicago). The relation of the parathyroid gland to cataract.** *Amer. Jl. of Ophthal.*, October, 1931.

(2) **Evans** and **Keen** having been struck by the possible association of parathyroid dysfunction and the production of senile cataract decided to analyse the lenses in dogs which had been rendered cataractous by thyroid-parathyroidectomy. During the survival period after operation the blood calcium was low while the calcium content of the cataractous lens was about 25 times the normal. On the other hand the inorganic phosphorous content of the blood was raised, while there was no significant alteration in the phosphorous content of the lens. The similarity between the changes in mineral content of lenses which have become cataractous as a result of senility and of parathyroidectomy leads the authors to the conclusion that "in some obscure manner" the cause "may be substantially the same in each case" and that "serious notice should be taken of the rôle of the glands (the parathyroids) in the maintenance of normal conditions of the lens proteins." Their results also show that the production of parathyroid cataract is in no direct way dependent on the calcium content of the blood.

F. A. W-N.

III.—MISCELLANEOUS

(1) **Giraudi, Gioffredo (Rome).—The syndrome of tumours of the apex of the petrous bone.** *Revista Oto-Neuro-Oftal.*, January-February, 1931.

(1) Though primarily of oto-laryngological interest this syndrome concerns the ophthalmologist, since the extra-ocular muscles may be implicated. The primary growth is usually a malignant neoplasm of the nasopharynx and the symptoms may be considered under three headings:—(1) Auricular, comprising catarrhal or purulent myringitis and otitis; (2) Trigeminal, caused by invasion of the *cavum Meckellii*, with resulting corneal anaesthesia and signs due to invasion of the other branches of the fifth nerve. The sympathetic root is sometimes involved also, causing slight ptosis and contraction of the pupil. (3) Abducens, due to invasion of this nerve, bringing about paresis, or more commonly, paralysis of the external rectus. The inferior portions of the apex of the petrous bone are usually destroyed and prognosis is bad, though radiological treatment may bring about clinical improvement and diminution of pain.

F. A. W-N.

(2) **Ferrer, Horacio (Havana, Cuba).—Diffuse hyperostosis of the sphenoid with great enlargement of the anterior clinoid processes: ocular manifestation.** *Amer. Jl. of Ophthal.*, May, 1931.

(2) Ferrer's case is of interest, both on account of its rarity and of the difficulty in diagnosis. The patient was a woman who had had defective sight in the right eye since girlhood. The defect had become gradually worse and vision, when seen, was reduced to counting fingers at two feet. The left optic disc was pale and slightly cupped, the vessels being rather distended on the nasal side. The left fundus showed some pallor of the temporal half of the disc, but was otherwise normal. There was a definite increase of the right intra-ocular pressure which increase disappeared under miotics. The peripheral fields were normal but there was a central scotoma for colours in the right eye. Investigations as to cause proved negative until an X-ray was taken of the skull which revealed hyperostosis of the body of the sphenoid and its wings with considerable enlargement of the anterior clinoid processes. The enlargement of this bone had produced a pressure atrophy of the right optic nerve, but curiously enough none of the other cranial nerves showed any evidence of injury.

F. A. W-N.

(3) **Lewis, Park (Buffalo, N.Y.).—Cataract in the eyes of fresh-water fishes, due to the invasion of the larvae of trematoid worms.** *Trans. Thirty-sixth Annual Meeting, Amer. Acad. of Ophthal. and Oto-Laryngol.*, French Lick, Ind., pp. 143-158, September 13-19, 1931.

(3) **Park Lewis** had the opportunity of studying in the Aquarium of the Buffalo Society of Natural Sciences a number of trout of all ages suffering from cataract. He found in the posterior portion of the cortex under the capsule a number of small objects in motion which proved to be the larvae of a trematoid worm of the fluke variety. A similar condition had been noted by Nordmann as early as 1832, and had been verified by other observers in perch and pike. The life history of this fluke is that the host in which the eggs are produced is ordinarily a vertebrate and in the case of the *strigeidae* (which is the fluke found in the fish's eye), the vertebrate is usually a bird such as a duck. Mature eggs from the bird pass into the pond and the active embryo takes up its residence in water snails and forms cysts. These sporocysts burst and migrate into the tissue of the snail, ultimately escaping through the body wall of the host, swim about in the water and, meeting a fish, penetrate the skin and get into the eye and after a time cause cataractous changes.

The reviewer has examined a number of fish with the ophthalmoscope. Cataract is common amongst fish which have been kept in an aquarium, although not very common in fresh water fish which live in streams. The cataract is seldom mature and therefore probably not due to the fluke. Opacity of the lens normally occurs very rapidly after any fish have been taken out of water.

M. S. MAYOU.

(4) **Powell, Lyle S. (Lawrence, Kansas). — Herpes zoster ophthalmicus.** *Amer. Jl. of Ophthal.*, September, 1930.

(4) **Powell's** paper opens with quotations from various workers. Thus: Teague, Goodpasture and Lipschutz state that herpes zoster is due to a virus "differing from the virus herpes simplex only in virulence" and Hunt "that the spinal fluid in this disease shows a marked increase of lymphocytes," Metz "that total ophthalmoplegia may occur" and Fuchs "that facial paralysis may also occur." Corneal anaesthesia or ulcerative involvement, with possible destruction of the eye, ptosis, mydriasis or cycloplegia may all be associated with herpes zoster ophthalmicus. Powell's own case showed deep corneal inflammation and paralysis of the seventh, ninth and tenth nerves—involvement of the latter two nerves being indicated by loss of taste on the posterior third of the

tongue, anaesthesia of the palate and pharynx and weakened response of the right vocal cord on phonation. There was also a low grade of uveitis in the affected eye.

F. A. W-N.

(5) **Mayer, Leo. L. (Chicago).—The vitreous in experimental detachment of the retina.** *Arch. of Ophthal.*, June, 1932.

(5) **Mayer's** paper is in the nature of a preliminary communication concerning work which may have an important bearing on the pathology of retinal detachment. In the first place, the author refers to a previous paper (Arch. of Ophthal. Vol. 7, pp. 449, April, 1932) concerning a mechanical method of artificially detaching the retina. The result of using this method was that although a hole was produced in the retina spontaneous reattachment occurred after 6 weeks. The author therefore felt that some other factor must also be at work, possibly in the vitreous itself, so he tried the effect of injecting 3 minims of a 1 in 4 dilution of saturated trypsin solution in normal saline. The result was to bring about a prolonged detachment of the retina which nevertheless was not permanent. Investigation of the vitreous in eyes thus treated showed an enormous increase in sugar content, an increase in total nitrogen and an increase in surface tension, while there was a decrease in amino nitrogen and hydrogen ion concentration towards the acid side.

F. A. W-N.

(6) **Abraham, V. Samuel.—Anterior chamber punctures in relation to intra-ocular tension.** *Arch. of Ophthal.*, June, 1932.

(6) It seems at first sight a logical proceeding in cases of raised intra-ocular pressure to puncture the anterior chamber, allow the escape of aqueous and so bring about a reduction of pressure. Unfortunately, for the success of this proceeding, a reactive hyperaemia occurs in the ciliary body and uveal tract generally, which may bring about a rise in intra-ocular pressure and result in the formation of new aqueous with a high protein content. On the other hand, hypotonia may occur in an eye whose function is subnormal or whose ciliary body has been paralysed by atropine. In primary and secondary glaucoma the results are variable, some cases showing a higher pressure after anterior chamber puncture while in others it is unaffected or may be reduced. **Abraham's** paper gives details of 9 cases illustrating these points.

F. A. W-N.

BOOK NOTICES

The Sight Saving Bureau. Vol. II, No. 2. Published quarterly by The National Society for the Prevention of Blindness. Inc. U.S.A. June, 1932.

This number of the Sight-Saving Review contains articles concerning the importance of social service and follow-up in preventing blindness, eye accidents in child play, illumination in industry, the conservation of vision and preventive work.

Hospitals without adequate social service departments are doing incomplete and inefficient work. Statistical studies in the New York Clinics demonstrate that many patients who have eye diseases which may result in blindness attend the clinic once only; of 193 such patients 103 made only a single visit for advice and treatment, and 81 per cent. of patients suffering from glaucoma came three times or less. The necessity for well-organised social service departments with adequate personnel for conducting follow-up work is obvious. It is also necessary in some instances to instruct the physician to use the social service department and that more follow-up work is needed to assure the proper treatment of patients, to conserve the physician's time in making his records valuable for research and teaching, and to prevent blindness. The ophthalmologist must gain the confidence of his patient by his thoroughness, his personality and particularly his interest in the patient.

It is recommended that pamphlets dealing with the nature and treatment of such diseases as cataract, glaucoma, squint, conjunctivitis, myopia and syphilis should reinforce verbal instructions to patients. Social workers should receive information about the aetiology, course and prognosis of eye diseases likely to result in serious defects of vision and in their practice endeavour as far as possible to eliminate or modify the exciting causes of such diseases.

Eye accidents to children are probably more numerous than is generally believed. In the schools and classes of the United States there are 500 pupils whose blindness is due to accidents and about 70 are added each year. Two-thirds of the eye accidents to children are due to weapons such as air-rifles, slingshots, arrows, fireworks and explosives. The National Society for the Prevention of Blindness has strongly recommended that prohibitary legislation be put into force against the sale of such articles to children. There is a need for continued education of both children and adults concerning the hazards that are inherent in many objects utilized in child play.

In an article dealing with illumination and eyesight in industry

it is stated that the Illuminating Engineering Society and American Standards Association have demonstrated that if a worker, because of good illumination, saves—in more production, better quality of product or decreased accidents—the equivalent of only three minutes per day for 300 days, he will offset the annual cost of illumination.

In this number there are other articles of interest which concern preventive work in sympathetic ophthalmitis and ophthalmia neonatorum; fourth of July accidents; notes; comments; current articles of interest and book reviews.

Royal Westminster Ophthalmic Hospital 115th Annual Report. 1932.

The 115th Annual Report of the Royal Westminster Ophthalmic Hospital contains a historical account of the "Royal Westminster Ophthalmic Hospital and its Staff in the past" by Adrian Caddy, a reprint from his paper in this Journal. Vol. XV, p. 498, Sept. 1931.

The hospital was founded in 1816 and established as "The Royal Westminster Infirmary for the Cure of Diseases of the Eye" in the western part of the Metropolis, for the relief of the poor and as a school of instruction. Originally the hospital was in Mary-le-Bone Street, Piccadilly, later it was moved to Warwick Street, Golden Square, and in 1832 transferred to King William Street, West Street, Strand, where it stood till 1926. There is an account of the surgeons, beginning with the founder of the Hospital, George James Guthrie (1816) down to modern times.

There is also another historical article, "A fragment of history," which concerns the geography of St. Giles and Broad Street from the Middle ages through the Tudor and Stuart periods to Victorian days.

The remainder of the report contains a survey of the work done by the Hospital and its several departments, the Lady Almoner's report, balance sheets and a list of subscribers.

Injuries of the Eye: Diagnosis and Treatment: Forensic Procedures and Visual Economics. By H. V. WÜRDEMANN, M.D., Sc.D., F.A.C.S. Second Edition, Royal 8vo, pp. 900, with 236 illustrations and 10 colour plates. London: Henry Kimpton. 1932. Price, £3 10s.

The first edition of Würdemann's work appeared in 1911. It represented the experience of the author during 22 years in a large manufacturing centre. This, the second edition, completes his 42 year's experience in ocular injuries. So far as we are aware, the last book to be published in England on this subject was

Maitland Ramsay's "Eye Injuries and their Treatment," which was published in 1907.

Würdemann claims that this edition is an exhaustive and authoritative work upon the subject, and this claim is certainly upheld by its perusal. The subject is presented mainly in its clinical and therapeutic aspects; it is essentially practical, but the subject of pathology has not been overlooked, enough of this being included to elucidate the text. No attempt has been made at a complete bibliography of the literature; only when the author's experience has not afforded illustrative cases has he given examples from the practice of others. For the most part the book is the result of a single surgeon's experience.

The book is arranged in three sections:—general injuries, injuries of the special structures of the eye and forensic medicine. Nothing seems to have been omitted, for the work includes a notice of the conjunctivitis occurring in those engaged in the manufacture of artificial silk, and an account of the recent work on ignipuncture in the treatment of retinal detachment; to name only a couple of examples of its thoroughness.

The wealth of illustrations adds greatly to its value; these include pictures of dangerous occupations such as a miner at work, and a collection of blacksmith's tools in bad repair; while those in connection with prophylaxis are especially valuable, such as the wire mesh guards on the water gauge for the protection of boiler men, a shield to prevent fragments flying from the lathe, goggles for furnace men and, in special instances, helmets.

The comparative rarity of eye injury from broken spectacles is noted and some illustrative cases appended. Abrasions during the administration of a general anaesthetic and traumatic neuroses after ocular injuries, including post-operative delirium are touched upon.

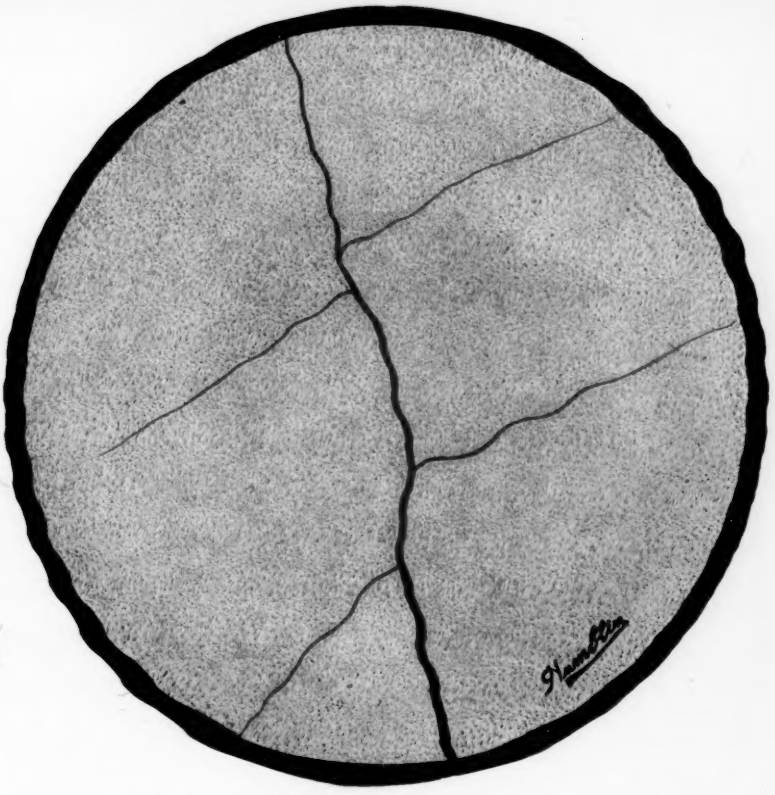
There is an excellent chapter on radiography in diagnosis, the author rightly emphasising the importance of having an X-ray picture taken in all cases where the presence of a foreign body in the eye or orbit is a possible complication. His statement that "the slit-lamp is of no particular benefit in examining injury cases" is tempered, by the inclusion of a couple of slit-lamp illustrations of corneal injuries.

The final section on the medico-legal aspects of ophthalmic injuries is full of interest and should be read by all hospital surgeons. A chapter on "protective legislation, pensions and accident insurance" includes a summary of the Workman's Compensation Laws of the World, and contains some interesting examples of decisions in disputed cases. In the last chapter, on visual economics, an attempt is made to determine the relation to and amount of economic damage resulting from injuries to the eyes and vision.

UNIV. OF MICH.

PIKE.

Fundus of a Pike showing the disc falciform process.



PERCH PIKE.

Fundus of a Perch Pike showing a different variety of falciform process.

PERCH PIKE.

The anterior part of the eye as *seen with the ophthalmoscope.* *(a)* Note the elongated pupil forwards showing the periphery *of the lens.* *(b)* The attachment of the falciform process to the posterior surface of the lens. *(c)* The commencing cataract in the lens.

CORRESPONDENCE

FISHY VISION*

To the Editors of THE BRITISH JOURNAL OF OPHTHALMOLOGY.

SIRS,—In reply to Sir James Barrett's letter in the August number of the *British Journal of Ophthalmology*, I know Beer's paper quite well "Die Accommodation des Auges in der Thierreihe."

In the fresh-water fish which I have examined I have been unable to confirm his observations on accommodation, but this may be because the eyes of most fresh-water fish are so small. I have tried them with drugs (atropine and eserine) and also estimated their refraction in water before and after death, and in all cases they were hypermetropic or emmetropic, although, of course, out of water highly myopic.

Microscopically, there is no ciliary body and I was not able to detect any real muscular structure. There is a falciform process which resembles a pecten which is attached to the posterior part of the lens to one side of the equator and is essentially a vascular structure as will be seen by the enclosed illustration.

In doing a retinoscopy on fish the reflex essentially comes from the pigment cell layer and silvery layer of the choroid; the anterior part of the retina being transparent like the human retina would not therefore vitiate estimation of refraction by this method, as suggested in Sir James Barrett's letter.

I enclose a drawing of the fundus of a pike seen with the ophthalmoscope. I do not think has been previously observed. The drawing was made in the water without any correcting lens at all in front of the ophthalmoscope and the fundus could be easily seen even with a +3·0 D.sph., showing that the eye is certainly not myopic, as is usually described. The dark pigmentation is, of course, due to the large amount of retinal pigment, the bright points being the silvery layer of the choroid. In fish this layer seems to be the same colour as the silvery layer on the surface of the iris. In angel fish where the colour varies, the silvery layer of the choroid also varies in corresponding colours.

Yours faithfully,

M. S. MAYOU.

September 12, 1932.

* The *Fishing Gazette*, February 20 to May 28, 1932.

NOTES

Royal Society of Medicine, Section of Ophthalmology

THE officers of the Section for the current year are as follows: *President:* A. C. Hudson; *Immediate Past President:* E. W. Brewerton; *Vice-Presidents:* J. Burdon Cooper, A. H. Levy, A. E. J. Lister, R. Foster Moore, A. Hugh Thompson, A. J. Ballantyne; *Members of Council:* J. L. Birley, T. Grainger Stewart, C. C. Worster-Drought, C. L. Gimblett, H. Neame, M. H. Whiting, A. D. Griffith, H. B. Stallard, G. C. Penman, P. G. Doyne, F. T. Ridley, A. Rugg-Gunn, D. M. Mackay, J. W. Tudor Thomas, E. R. Chambers, D. M. Wilson, E. F. Wilson, E. V. Oulton; *Bowman Librarian:* F. A. Williamson-Noble; *Representative on Editorial Committee:* R. C. Davenport; *Secretaries:* O. Gayer Morgan and J. D. Magor Cardell.

* * * *

Ophthalmological Directory

THE Secretary of the International Ophthalmological Council informs us that at the end of this or at the beginning of next year a new edition of the directory called "Indicia" will appear. This book contains data on the following items, viz.:—

1. Names and addresses of all oculists in the world.
2. The world's ophthalmological journals.
3. The world's ophthalmological societies.
4. Public hospitals more or less exclusively intended for nursing diseases of the eyes and the number of beds at their disposal.
5. Institutions and schools for the blind.
6. Statistics of blindness.

Any one wishing to make suggestions or corrections concerning these items is invited to address his communications to E. Marx, Secretary, Oostzeedyk 316, Rotterdam (Holland).

FUTURE ARRANGEMENTS

1932

November 11.—Royal Society of Medicine, Section of Ophthalmology.

November 11.—North of England Ophthalmological Society, at Bradford.

December 9.—Royal Society of Medicine, Section of Ophthalmology (Clinical Meeting).

December 9.—North of England Ophthalmological Society, at Leeds.

1933

January 13.—Royal Society of Medicine, Section of Ophthalmology.
February 3.—North of England Ophthalmologlcal Society, at Newcastle-on-Tyne.
February 10.—Royal Society of Medicine, Section of Ophthalmology.
March 3.—North of England Ophthalmological Society, at Liverpool.
March 10.—Royal Society of Medicine, Section of Ophthalmology Clinical Meeting).
March 31.—North of England Ophthalmological Society, at Sheffield.
June 9.—Royal Society of Medicine, Section of Ophthalmology (Annual Meeting).
July 5-8.—Oxford Ophthalmological Congress, at Oxford.

CONTEMPORARY OPHTHALMIC LITERATURE

American Journal of Ophthalmology. *September, 1932.*

LANCASTER. Ocular symptoms of faulty illumination.
ALLEN. The principle of induction in color vision.
LUCKIESH and MOSS. Researches in seeing.
JAMES, W. M. Ocular pemphigus.
SHANNON and MCANDREWS. Lymphomas of the conjunctiva.
CASTROVIEJO. Keratoplasty. Part I.
BAILEY. A new chalazion forceps.
FISHER, W. A. A new suction method for the intracapsular cataract operation.

Archives of Ophthalmology. *September, 1932.*

BERENS. Resection operation for strabismus.
CLAY. Angioid streaks of the retina and pseudoxanthoma elasticum.
PHILLIPS, DIRION and GRAVES. Congenital bilateral palsy of the abducens.
TYSON. Nevus flammeus of the face and globe associated with glaucoma, vascular changes in the iris, and a calcified vascular growth in the left occipital lobe of the brain, with right homonymous hemianopia.
MCGUIRE. Gyrate atrophy of the choroid and retina (Fuchs).
LEHRFELD. Vernal conjunctivitis. Observations on 87 cases at the Wills Hospital (1929-1931).
MANN, W. A., Jun. Color photography of the fundus oculi. Description of a new method.
ATKINSON. Retinitis punctata albescens. Report of two cases in which the dots disappeared,
GIFFORD, LEBENSOHN and PUNTENNY. Bio-chemistry of the lens. 1. Permeability of the capsule of the lens.

Annales d'Oculistique. *August, 1932.*

GABRIÉLIDÈS. Primary non-pigmented sarcoma of the lid.
LOBEL. Two cases of detached retina operated on by the method of Lindner-Guist.
FIETTA. The value of iontophoresis in ophthalmology.
ADAMANTIADIS and RANGABI. Double cataract from the use of X-rays on the face.
COSTI. Heterochromia and cataract.
MORAX. Can sympathetic ophthalmitis develop without perforation or rupture of the ocular membranes?

Archives d'Ophtalmologie. *September, 1932.*

TERRIEN. The clinical value of heterochromia iridis.
MARQUEZ. On hydatid cysts of the orbit.
FAGE. Variability of the forms of corneal herpes.
BONNET. Ocular paralyses in injuries of the skull and face.
LACAT. In memory of Dr. Abadie.

Klinische Monatsblätter für Augenheilkunde. *September, 1932.*

ELSCHNIG. On the recording of tonometric readings of tension.
REHSTEINER. Acute concentration of cholesterin in the anterior chamber.
RIEDL. A case of cyclodialysis traumatica maxima.
ZITTING. Researches on the sensibility of the cornea in trachoma.
KUBIK. On the technique of diascleral removal of splinters of iron situated far back in the sclera.
VANNAS. Clinical and experimental investigations on the anterior part of the vitreous particularly after intracapsular extraction.
WIEDERSHEIM. Recording of the path of movement of both eyes with the photonystagmograph.
SCHLÄPFER. Further observations on late contusion cataract with reference to rudimentary forms.
DIMISSIANOS. On the differential diagnosis of carcinomatous metastases in the eye.
JUHASZ-SCHAFFER. Retro-bulbar neuritis from Apiol poisoning.
HAMBURGER. Acute glaucoma and acute inflammation.
STREBEL. On the symptomatic treatment of hay fever.
HARTMANN. Blepharochalasis with struma and harelip.
FAZAKAS. The care of an extraordinarily large symblepharon.

Zeitschrift für Augenheilkunde. *September, 1932.*

BERNEAUD. Allergic diseases of the eye.
KUNZ. On the indications and results of Gonin's operation.
BACHSTEZ. On the localisation of the inflammation in serous Tenonitis.
MYLIUS. On post-operative intra-ocular shrinkings and distortions and their treatment.
FREUDENTHAL. On two cases of familial endothelial dystrophy of the cornea with existence of generalised degenerative changes.
ENDELMAN. Two cases of suddenly arising bi-temporal hemianopia of unexplained aetiology (? early symptoms of disseminated sclerosis).
MEVES. On the differential diagnosis of the Foster-Kennedy syndrome.
MALKIN. Iodine ionisation in senile cataract.

Bollettino d'Oculistica. *August, 1932.*

SGROSSO. Clinical and experimental researches on the vitreous.
FEDERICI. Post-operative syphilitic interstitial keratitis.
GALEAZZI. Contribution to our knowledge of the atypical forms of retinitis circinata.
CUSUMANO. On the path and mode of transmission of acute Koch-Weeks conjunctivitis.
LAMPIS. An optical phenomenon.

Archivos de Oftalmologia Hispano-Americanos. *September, 1932.*

ARRUGA. Considerations on the cure of detached retina.

Revista Cubana de Oto-Neuro-Oftalmiatria. *July-August, 1932.*

JOSÉ GONZÁLEZ. Investigations of nuclear inversion in patients with phlyctenular kerato-conjunctivitis.
LACAT. Considerations on the medical treatment of glaucoma.
AVALOS. Serious bi-lateral uveitis accompanied by canities.
AVALOS. A new case of serious bi-lateral uveitis accompanied by deafness, baldness and canities.
ZAPPINO. Injections of sodium iodide in glaucoma and other painful affections of the eye.

Revista Oto-Neuro-Oftalmologica. *September, 1932.*

BISTIS. The ocular complications of the arsenical compounds.
PAVIA. The fundus and general disease.